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ABSTRACT

A road safety study was conducted by the University of Salford, Great Britain, in order to evaluate the effects of secondary level driver education in reducing the occurrence of accidents. It examines the feasibility of using accidents and traffic offenses as criteria for evaluating courses in driver education. To achieve this objective, 1,800 boys and girls between 16 and 17 years old were recruited and divided into control and experimental groups. The participants were observed over a period of three years on various factors related to driving accidents. The relationship of various factors to driver education is examined based on their effects on accidents and traffic offenses. Driving experience and exposure to risk are important variables in determining the relationship between driver education and accident frequencies. Involvement in accidents by boys and girls were analyzed based on forms of training, driving experience, and interaction with the car. The results of the study reveal that driver education reduced traffic offenses in the short term and was replaced by experience in the long term. It also showed that the cognitive factor is important in determining accident reduction. The discussion is supplemented with extensive tables and charts. A list of references is included. (EC)

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Road Safety Research Unit

Department of Civil Engineering

REPORT

THE USE OF ACCIDENTS AND TRAFFIC OFFENCES AS CRITERIA FOR EVALUATING COURSES IN DRIVER EDUCATION

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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THE USE OF ACCIDENTS AND TRAFFIC OFFENCES AS CRITERIA FOR EVALUATING COURSES IN DRIVER EDUCATION

Jean Shaoul

Road Safety Research Unit
University of Salford
1975

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Other publications of the Road Safety Research Unit relating to this experimental evaluation of driver education.

Raymond, S., Jolly, K. W., Risk, A. W., Shaoul, J. E. "An evaluation of the effectiveness of driver education in reducing accidents to young people". University of Salford, 1973.

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CHAPTER ONE INTRODUCTION

The central problem of the driver, road, vehicle and traffic system is one of reducing the rate and severity of accidents. The task of the research worker is to seek to determine the objective laws governing the occurrence of accidents so that the frequency and severity of accidents may be predicted and controlled. Most of the emphasis has been on improvements in car and road design. Research on drivers has in the past tended to focus on the driver as an individual rather than as a driver who interacts with a complex system. Accidents were seen as human errors, not in the system sense of the word, but in the legal and moral sense. This concept of accidents led research in the direction of accident proneness, faulty attitudes, personality etc., and pointed to countermeasures that took the form of punishment and deterrence. It never produced any findings that were conclusive.

Research on driver behaviour, as opposed to research on drivers, which attempts to relate individual differences to failures of the driving task has only just begun to emerge. Human factors is one of the newer disciplines which attempts to assess the design implications of behavioural studies so that the improved physical environment offers fewer inducements to unsafe behaviour and protects the road user from the most severe consequences of such behaviour. This approach is gradually gaining acceptance in traffic safety in preference to punitive measures. Likewise, increased attention is being paid to accident countermeasures which seek to influence the driver directly e.g. propaganda and driver education, which focus on changing individual behaviour so as to reduce exposure to risk or to inhibit actions that are believed to be related to the precipitation of crashes.

Driver education is one type of countermeasure directed towards influencing driver behaviour. It assumes that the drivers' current knowledge, skills and attitudes are inadequate or incorrect and that their improvement or correction will reduce the likelihood of their causing a crash. However, 'improper' driving can only be implicated as a causal factor if it occurs more frequently in those involved in accidents than those not involved. Good evidence on this is lacking.

Driver education typically consists of classroom as well as the usual car instruction, in the schools. For many years now, driver education has been of major importance as a method of teaching young people to drive in the United States. In recent years, interest has been expressed, in this and other countries, in this method of driver preparation. It is a novel departure from the normal school activity and if it is to be justified on safety grounds (as opposed to teaching young people a relevant skill or using it as a focus of interest for students who are uninterested in the conventional subjects taught in the school), then its contents must be based upon empirical findings as they relate to accident causation rather than popular belief, and its effectiveness in preventing accidents must be demonstrated.

Thus driver education is to be seen in the context of road safety as a preventative measure. Authors of many studies in the field of road safety conclude in general terms that their research have important implications for training. But this is never spelt out. There is no recourse to existing psychological theories concerning preparation, education and training to specify the possible achievements of driver preparation nor the limitations of education due to the conflicting operation of other forces. Driver education tends to be the rag bag category, to be used when all else fails. Most criticisms of driver education evaluation research have centred upon the methodological weaknesses in the evaluation of its efficacy as an accident countermeasure. The contents (as opposed to the methods) have never been scrutinised.

The purpose of the University of Salford's road safety experiment was to evaluate the effects of a course in driver education introduced into the curriculum of sixth form students (i.e. 16 - 17 year olds) in terms of accident reduction. It soon became clear that it was necessary to evaluate such a course in general educational terms i.e. knowledge and proficiency tests during the acquisition of the driving skills, in behavioural terms i.e. the way young people drove once they had qualified as a driver and their patterns of car usage, as well as in accident terms. To a certain extent, the latter type of evaluation is dependent upon the former since without evidence of transfer between classroom (the essential and novel feature of driver education) and car instruction, the transfer between training and subsequent performance is unlikely.

Thus the Salford experiment was not concerned with curriculum development for driver education but with the evaluation of such a course. This, in retrospect, can be seen as premature, since no such curriculum had been developed and tested in this country for such a group of young people. The course used in the experiment was therefore, no more than an attempt to design such material as could be used in the classroom. It was not based on experimental evidence as it relates to the nature of the driving task and accident causation. It was, in the first instance, based on the American textbooks which were available in this country. These were heavily biased in favour of "attitude change". It was found to be unsuccessful, in terms of pupil reaction and interest, and consequently was reformulated in terms of the knowledge, procedures, rules etc., as embodied in the Highway Code and Driving Manual, which, it is thought, drivers need to be familiar with. The nature of the original question asked, being a very general one, therefore inevitably restricts the kinds of answers that can be given to very general ones and chiefly serves to clarify the nature of the problems inherent in formulating such a question.

It seems pertinent at this point to note briefly some of the findings and implications of the evaluation study so far so as to provide some guidance for administrators, road safety officers and teachers who may be considering developing their own courses and so that the relationship between training and accidents may be clarified. Such results relating to success in the D.O.E. test which indicate the existence of differences between those who had completed a course of pre-driver training, a full course of driver education, a simulator aided course of driver training or no course at all, which could be attributed to attendance at such a course, suggest that the transfer between class and car instruction is greatest when combined with extensive practice. The pre-driver training and the simulator courses involved very few hours of practical instruction. As a method of instruction, they were no more successful than the conventional methods of learning to drive with a friend or relative, taking lessons from a professional instructor or some combination of both. Only the full course of driver education (i.e. when supplemented with 15 hours of driving instruction) was more effective in achieving the standard required to pass the driving test.

This therefore, raises the critical nature of the integration of the classroom and practical phases of the course. In our experiment, the in car instruction was carried out by a commercial driving school and apart from requesting them to instruct their pupils to wear seat belts, there was minimal direction exercised over them. In addition because many of the pupils were not seventeen until the end of the course, their practical instruction was deferred until later. All students received several hours of instruction on a private training course and transferred when they were seventeen to the public roads. The off road lessons were relatively infrequent, short and in the company of other students, whereas the on road lessons were about one hour in length, private (i.e. one to one instruction) and spaced at intervals

to suit the student.

There is some evidence that the pupils found the driving range helpful in the early stages of learning to drive. Unfortunately, the length of time (about 6 hours) spent on the driving range was determined by factors other than the individual's proficiency. Thus in some instances, students felt they were not progressing adequately. Most driving instructors are unaccustomed to giving tuition to a learner in the company of other learners and tend consequently to direct their comments solely to the pupil who is driving. Secondly, the two pupils sitting in the back of the car typically do nothing. If some constructive use is to be made of the administrative necessity of teaching three pupils in a car at once, (it may be a useful teaching aid in its own right for those who have had little experience in the car even as a passenger), it is suggested that they be given a task to do which would focus their attention on the road and the driver's actions. For example, assessing the driver's proficiency has the added advantage that the criteria for judging whether the performance at a particular task is adequate or not, have to be made explicit to the students. They will learn them more easily by having to apply them. It is important that teachers give more thought to the integration of the two phases, both with respect to timing, frequency, length and content of practice as well as the extent to which the content of the two phases overlap.

Insofar as one can tell from the students' reaction, the classroom course seemed to be successful. One of the problems was that it was not an integral part of the school's activities. The course was taught by a peripatetic teacher (with all that that implies for pupil-teacher interaction), and sometimes to very large groups. Consequently, the opportunity for discussion and questions was limited. In addition, it was taught as a compulsory subject to all the students in the lower sixth form. The nature of the results of the evaluative study suggest that a course of driver education would be more effective if given to only those who intend to learn to drive in the next few years. Even after 4 - 5 years, only about 60% boys and 36% girls in our sample had passed the driving test, and during the period of the study 80% of the boys and 73% of the girls had ever taken out a provisional licence. The availability of a family car was the major reason for starting to learn to drive and an important determinant in whether or not the pupil persevered until he/she reached test standard. Apart from considerations of costs and students' interest in the subject, our evidence suggests that it is unlikely that the content of the course will be retained if they do not qualify as drivers shortly after the course.

An analysis carried out 2 - 3 years after the end of the course suggested that driver education had increased the number of drivers over and above what might normally be expected. After 5 years, this difference was no longer apparent. i.e. the course accelerated the decision to learn to drive in the short term. Several effects were apparent in the short term but later disappeared - suggesting that some results may be achieved but they are short term and transient. To be effective and of value, they must be more stable.

With respect to the content of the classroom instruction, it is not clear the extent to which it is important beyond the aim of reaching driving test standard or even for the test itself. There was evidence to suggest that the boys who had not received such instruction, acquired the same amount of formal knowledge, albeit by other means and over a longer period. In addition, the girls passed the test with considerably less knowledge about driving whether or not they had been on the course. It was also abundantly clear that if this type of course is to be given to both boys and girls, that more attention must be given to designing a course which is consonant with their pre-existing state of knowledge about driving. The boys start off by

knowing considerably more about driving than the girls do, and the gap does not narrow, even after attending such a course.

However, since this knowledge could not be shown to be related to subsequent performance as a qualified driver or to accidents, the whole philosophy of the course may be in question. Such evidence as it relates to the different driving performance of the groups suggest that the course should aim to give the students guidance about how to derive information from the car, road, traffic system and alter their speed and direction accordingly, rather than knowledge of the rules and procedures as such. That is, the rules and procedures should be covered insofar as they permit information to be gained in the best possible way, e.g. taking up a particular position on the road before turning not only permits the driver the widest view but also gives the clearest indication to the other road users of his next move. An approach such as this gives the course a more coherent framework and is orientated towards safe practices.

There is also some evidence to suggest that some of the decisions a driver takes before starting the car are vital for safety and more consideration should be given to this, e.g. seat belt usage. In principle, numerous sources of information (accident studies, driver performance, young drivers and attitudes etc.) might be used to guide the selection of content for classroom instruction. However they do not, for the most part, provide information which directly tells the teacher what to teach since most of the information does not deal with the process of learning to drive or even driving as such. In any event, the exact relationship of these aspects of performance to safety has not been established.

With respect to the behavioural measures used to evaluate driver education, that is driving practices, e.g. the amount of night driving, seat belt usage etc., performance in driving tests as a qualified driver, no differences were observed between the groups who had received different types of training, which could not be attributed to other factors. The only major difference between the groups is the effect the course has had on the mileage driven by the groups. Those who had received the full course drove significantly less than those who had not received the course, and fewer of them actually drove at all, once qualified. Thus it would appear that the course (as a result of the emphasis on safety) has had the effect of reducing their exposure to risk - mileage. Yet again, we do not know what is producing this effect on mileage - yet it is consistent with American research findings.

The purpose of this study was to determine the feasibility of using accidents and traffic offences to measure responsiveness to courses in driver education. Although a reduction in accidents is the major objective of driver education, used as a criterion for observing changes, accidents present many problems since they are homogeneous only with respect to outcomes rather than antecedent behaviour. Similarly the reliability of traffic offences as a criterion of safety has also to be demonstrated. Insofar as either or both of these are unstable measures of behaviour, they cannot be used to assess changes in individual driver behaviour with any certainty.

This study forms part of a very much larger study being carried out at the University of Salford to examine responsiveness to driver education and the part played by it in accident reduction. This report is therefore one of a series to be published about driver education. It is inevitable that a report such as this should fall between two stools, by trying on the one hand to include as much as possible about the nature of the assumptions upon which driver education and this experiment is based, and on the other hand not to be overly repetitious about the nature of the course, the experimental design etc., which have already been discussed elsewhere. Consequently, the

reader is frequently referred to other reports relating to this experiment.

The report firstly discusses the purpose of the evaluation, the objectives and nature of driver education and the kinds of criteria that may be used. The place of accidents and traffic offences in this context are examined. Secondly the implications of the quasi-experimental design, the major focus of interest of the research project as originally conceived and the methods of data collection for the analysis and interpretation of the data are discussed.

The fourth chapter presents the data as they relate to the reliability of accidents as a criterion, the relationship between age, experience, mileage and sex and accidents in order to isolate the effects of driver education. Most differences between the groups were accounted for by factors other than training. The accident data are also examined in detail in order to assess the relationship between driving practices and accident involvement. The sixth chapter discusses the differences between the formally trained and untrained groups with respect to traffic offences and the way these are related to other variables other than training in order to isolate the effect of training. Again, there is little evidence that training has affected the number of prosecutions since most of the observed differences could be explained by other factors. Finally the relationship between accidents and traffic offences is studied.

It should be borne in mind that we have, as yet, no evidence at all that driver education has been successful in reducing the accident rate per mile. The commonly quoted accident rate per driver is misleading since the frequency of accidents is related to exposure to risk which is measured in terms of mileage. Indeed, because of the nature of the criteria, namely accidents, it is probably impossible to mount such an experiment that could show a positive and causal relationship between driver education and accidents. A study of all the accidents reported by the sample showed that such differences as were observed in the accident rate per driver could be explained by other factors. The importance of exposure to risk (as measured by mileage) was paramount. In addition, it was found that the likelihood of being involved in an accident declined as experience increased. Not only did the ability to avoid precipitating a crash but also the ability to avoid becoming the "innocent" victim of an accident increased with experience. Thus clearly, safe driving as reflected in the absence of accidents, is learned behaviour. Although this is discernable from our data, our data do not tell us what is in fact being learned.

Thus neither of the two conditions required to justify driver education on safety grounds (as opposed to teaching young people a relevant skill, or using it as a focus of interest for students who are uninterested in the conventional subjects taught in the school) have been met. The contents of the course could not be based on empirical findings as they relate to accident causation since little research has been done in this area. Secondly, its effectiveness in preventing accidents has not been demonstrated.

The major task for driver training is to arrive at objective standards of safe and proficient performance. Since we have evidence to suggest that drivers learn from the practical activity of driving itself to become accident free, this implies studying the exposure to risk data more carefully to see how this varies with experience, and to examine firstly how driver behaviour (as measured by our tests) and secondly how the attendant circumstances of the accident vary with these factors. In this way, it should be possible to discern what is being learned and how this learning takes place. From this knowledge, it will be possible to specify more precisely the critical requirements of the driving task and consequently devise the appropriate training procedures.

CHAPTER TWO RESPONSIVENESS TO DRIVER EDUCATION

The purpose of the study described in this report is to investigate the transfer that takes place between types of driver training and subsequent involvement in accidents and traffic offences. The frequency of accident and traffic offence involvement of those who had received a course of driver education will be compared by means of self-reported data on driving, accidents and traffic offences with those who had received conventional driving instruction.

It forms part of a very much larger study which seeks to evaluate driver education, which is being carried out at the University of Salford. Evaluation has a wide range of functions. It may be defined as "the collection and use of information to make decisions about an educational programme" as Cronbach (1969) has in fact done. He proposed that the main objective for evaluation is to uncover durable relationships - in particular, those appropriate for guiding future programmes. It should aim to ascertain what effects the course has - that is, what changes it produces in pupils. This is not merely to enquire whether the course is effective or ineffective. Outcomes of instruction are multi-dimensional and a satisfactory investigation will map out the effects of the course along these dimensions separately. To accumulate many types of post course performance into a single score - namely, in this instance, accidents - is a mistake, since failure to achieve one objective may be masked by success in another direction.

Evaluation should be able to identify those aspects of the course where revision is desirable. Naturally, those responsible for developing a course would like to present evidence that their course is effective. This has meant, in the past, that the evaluator has only been called in on the completion of course development and after its widespread administration. Such an evaluation cannot hope to be very influential in course improvement, since the innovator is naturally reluctant to change radically something that has cost him so much effort and is now complete. Evaluation can contribute more to the improvement of education if it is carried out while the course is still in its formative stages.

As far as possible, evaluation should be used to understand how the course produces its effects and what parameters influence its effectiveness. It is to be hoped that such studies will do more than simply provide information about a particular course and help us to understand educational learning.

Evaluation is too often seen as very narrowly based. There are several approaches to evaluation. These include process studies, proficiency measures, attitude measures and follow up studies. A process study is concerned with events taking place in the classroom, proficiency and attitude measures with changes observed in the pupils, and follow up studies with the subsequent experiences of those who participated in the course. The follow up study comes closest to observing the ultimate educational contributions, but the completion of such a study is so far removed in time from the initial course that it is of minor value in improving the course or explaining its effects. It differs from the other types of evaluation study in one major effect. The former emphasise the departure of attained results from the ideal, differences in apparent effectiveness of different parts of the course and differences from item to item - all of which suggest places where the course could be strengthened. The follow up study, on the other hand, appraises effects of the course as a whole and has very little meaning unless outcomes can be compared with some sort of base rate. It is necessary, therefore, in a follow up study, to obtain data on a control group equated at least crudely to the experimental cases on the obvious demographic and potentially relevant variables.

Before anyone can drive a car in traffic, one has to learn how to do so. Learning, in western society, tends to require a teacher - whether formally qualified or not. In the case of learning to drive, this teacher is usually a friend or relative of the learner driver or an instructor from a commercial driving school. Recently, interest has been expressed in the American system whereby a learner driver is taught by a qualified teacher in the conventional educational environment, namely the school. Before such a scheme became widespread in this country, it was felt that it would be desirable to assess its effectiveness in reducing accidents. An experimental evaluation of driver education was therefore mounted by the University of Salford. It soon became clear, however, that a more widely based evaluation, as outlined above, would provide far more information about driving instruction, whether formally or informally taught, its contribution to accident reduction and the ways that it might be improved.

Outcomes of driver preparation will be related at least in part to the objectives, contents and methods of such preparation. Driver education programmes have two major components, the classroom phase and the in-car phase. Although these components should be closely co-ordinated in the conduct of any course, they perform distinct functions and therefore deserve separate consideration. Risk (1973) has discussed the nature of these two component parts of driver education. Suffice it to say here, that broadly speaking the objective of the classroom phase is to teach the knowledge of the kinds of practices that will promote safe and proficient driving, and the objective of the in-car phase is to provide the opportunity for the learner driver to acquire the skills that will enable him to drive safely and proficiently. This of course requires that the content of the two phases is very different, although they will overlap at some points since guidance given in the classroom on say, how to turn right onto a major road will involve explaining a procedure which will have to be carried out during the practical instruction.

The central objective of a driver education course should be to develop the student's capacity for safe driver performance. Therefore the classroom phase of instruction should provide for the acquisition of knowledge which best contributes to this central objective. It implies that the contents should be selected (or rejected) on the basis of their potential influence on safe performance. The selection of the content should be based, in part on an awareness of relevant research evidence and other authoritative sources of information.

In principle, numerous sources of information might be used to guide the selection of content for classroom instruction. In fact, the range of possible sources is prohibitively wide considering the information available in all the applied sciences which might have some relevance to the teaching and learning of driving. However these sources provide background information which the teacher must interpret and apply in his selection of content. For the most part, they do not provide information which directly tells the teacher what to teach, since most of the information does not deal directly with the process of learning to drive, or even of driving as such. For example, the information that failure to give way at junctions is cited as a major cause of accidents, has limited value because of the lack of specificity. The teacher needs to know more about why a driver fails to give way, before he can design a course of instruction that will lead to the avoidance of this infraction of the rules. In addition, much of the evidence is fragmentary or inconclusive.

One possible source of information are the studies of factors contributing to accidents - in particular driver actions. Large numbers of studies are available, from the nationally compiled accident statistics to case studies. Many different types of factors have been studied:- these are usually

subdivided into three groups, namely human factors such as age, personality, degree of intoxication, vision etc., environment factors such as type of road, amount of light, weather conditions etc., and vehicle factors such as condition of brakes and tyres, stability etc. Generally these studies attempt to identify factors which are associated with accidents so that corrective measures can be taken. These kinds of studies are useful for driver education, e.g. drinking and driving, where the classroom phase provides an opportunity for explaining many aspects of the problem. But the data available on driver actions which contribute to accidents are of various types. In some instances, the broad categories are too meaningless to permit a course to be based on them, e.g. turning right is a manoeuvre which is associated with a large number of accidents. But given the variation in road design and traffic control devices, this group of accidents contains numerous sub-groups of manoeuvres, all of which are right turns. The more thorough case studies of traffic accidents usually involve a relatively small number of accidents; consequently it is difficult to generalise those results of these studies to drivers in general.

There are other accident studies carried out by traffic engineers which focus on the relationship between the road, traffic and accidents in order to control traffic to maximise flow, and they provide another source of information for the content of driver education. For example, the finding that the installation of traffic lights at crossroads reduces the danger of two vehicles travelling in different directions colliding, but increases the likelihood of rear-end collisions, might influence the teachers' decision about what to teach students with respect to approaching controlled intersections.

There have been many attempts to analyse the driving task, i.e. to analyse and describe the elements of performance involved in driving. In some cases, the analysis is concerned with perceptual aspects of the driving task, in others a more comprehensive description is attempted. Some focus on measuring errors, some present an engineer's view, others emphasise the psychological aspects of driving and others the large number of tasks. Thus, there is no one description of the driving task but a variety of different ways of viewing the driving task, albeit with some common elements, e.g. most regard the driver's perception and interpretation of the situation as being central to the task of driving. But while these studies provide a deeper understanding of the driving task, they rarely specify a particular technique or set of techniques which represent optimal driving performance and which could be taught to beginners, since current knowledge is limited and does not permit a precise definition of optimal procedures. They do not deal with the task of learning to drive.

Recently, greater attention has been paid to driver performance. Again, the methods used to monitor performance vary enormously from vehicle instrumentation to filmed records to driving observations. Many different aspects of driver performance have been investigated, e.g. judging and maintaining following distances, estimating the speed of vehicles, the effect of fatigue on driver performance, gap acceptance in merging traffic situations, accelerator, brake and steering wheel movements, drivers' eye fixations, overtaking, etc. etc. However, their usefulness is limited. Generally, few studies were designed to uncover relationships between elements of driver performance and accidents. Hence it is still not clear what are the critical distinctions between safe and unsafe driving performances. Nevertheless, they do provide evidence of the extent to which the commonly prescribed procedures for particular manoeuvres are in fact being carried out. Insofar as they are presumed to be related to safety, they therefore at least suggest areas that need stressing. In addition, some of the measurements showed that they could distinguish between different groups of people at different levels

of experience. This implies that they could be used as indices of driving skill and that driver educators might use them as one way of assessing progress.

A further source of information as it relates to the selection of content of driver education material is the vast literature relating to young drivers and attitudes. It has frequently been stated that driving attitudes play an important part in safe driving. There is a substantial body of research evidence relating predispositions characterised by agression, conformity, impulsiveness etc. to obtained accident data. There is similar research evidence connecting various temperamental and personality characteristics and traits. Nevertheless, the precise way in which these parameters engage and influence task performance and other aspects of vehicle use is still obscure. Hence, although it is possible to identify the general nature of these attitudes which are associated with an accident free driving record, it is less easy to specify which aspects of vehicle use (controls, use, mileage etc.) are primarily being influenced or under which driving conditions. Evidence from those studies which have been carried out in sufficient detail does suggest that a major influence is exerted on the interactive aspects of driving, i.e. on the way drivers perceive and react to others. However, a full analysis of attitudes relating to these and to other characteristics of vehicle use and to other conceptually similar constructs, such as beliefs and values, has yet to be done. In any case, knowledge as it relates to changing attitudes is limited.

There is another factor that ought to be taken into account when selecting the content of driver education - namely the needs of young people as reflected in their patterns of car usage and accidents. It may be that particular types of hazard present more problems for younger than older drivers and that their pattern of driving requires a particular type of training or emphasis. For example, if, as is generally believed, young people typically drive old cars, a course may need to emphasise the need for certain minimum standards of car maintenance and show the students how to do this. However, little information is available on the way young people interact with their cars and the ways in which their accidents are consistent with those of older, more experienced drivers, as it relates to young people in this country. This seems to be areas of study worthy of greater attention.

The literature as it relates to accidents and driving is vast. Just a few of the areas which seem to be the more directly related to the driving task and to important elements of safe performance have been outlined. But it is clear that the exact relationship of these aspects of performance to safety has not been established. In addition, those concerned with course content are restricted in the amount of time they have available. Since it is difficult to assess their relative contribution to safety, the teacher has to use his own judgement rather than any objective criteria as to which items to include and which to reject. In any case, given some order of priorities, he has to decide how to teach it most effectively and it does not necessarily follow that those of lesser importance will be easier to teach or vice versa. Thus decisions must also be made about the difficulties with respect to learning these tasks when selecting the content of such courses. Nevertheless, the selection of content should depend on the prior establishment of objectives for the course. As has been stated before, the underlying philosophy of the course was to teach the students about the principles and procedures conducive to safe driving. As will be seen from the outline of the course by Jolly (1975), apart from teaching them about the control of the car, procedures for negotiating various hazards, the law as it relates to driving, science and driving, driving skills, the course also dealt with driving under difficult conditions, seat belt usage, motorway driving and "reading the road".

Thus, broadly speaking, the course is based on the legal requirements, procedures and conventions laid down in the Highway Code (Ministry of

Transport, 1970) and Driving Manual (Ministry of Transport, 1970). It did not (and could not, given the lack of knowledge) attempt to teach driving as a set of principles which determine safety. It is a measure of our inadequate understanding of the driving task that it has still to be taught as a series of rules rather than principles. Yet it is a fundamental tenet of educational practice that the acquisition of a skill or knowledge is more readily facilitated by describing the basic principles underlying the skills than by listing a series of rules and admonitions.

Insofar as the course is a series of rules, warnings etc. which are external or peripheral to the task of driving in the traffic environment e.g. insurance and licensing regulations, or have been devised in the absence of evidence to support their relationship with safety e.g. the push and pull method of steering or the advice that the driver should always look in the mirror before carrying out a manoeuvre, driver education may be seen as an attempt to persuade drivers to act in a particular way. That is, broadly speaking, the task of propaganda and persuasive processes, which assume that the driver is free to act as he choses. This model would tend to imply therefore that the task of driver education is to persuade him to drive in some approved manner. However this ignores the nature of the driving task. The driver is not free to act as he chooses. His decisions and actions are very much determined by the limitations of his car, the road configuration and the presence of other traffic. The frequency of accidents at particular points on the road network bear witness to this. Therefore a model of driver education which does not integrate the driver's actions with the road/traffic environment can have little effect on driver behaviour. Its effects will be more social than behavioural. These assumptions therefore influence not only the outcome of driver education but also the criteria that should be used to assess the outcomes.

It has been suggested earlier that driver education is closely akin to social influence or persuasive processes in general. The descriptive paradigm for categorising the many known variables in social influence is characterised by the essential sequence as "who says what to whom, how and where and with what effect". Such an approach leads to an organisation of knowledge under the headings of communicator or source, message, audience and response dimensions. But this is a static, a theoretical, purely descriptive, classification model. A different formulation which would be more helpful would describe some of the primary psychological processes involved, showing how variables interact or operate differently at different stages in the sequence. A process model might hypothesize that change in opinion is a combined function of an individual's initial position, his attention to the communication and the message and comprehension of its arguments, examples, appeals and conclusion and general and specific motivation for accepting its position.

Abelson (1959) lists a summary of social psychological findings which relate these variables to changes in attitudes and behaviour and permit the formulation of specific strategies and tactics for accomplishing this end. As a result of these findings it is possible to formulate hypotheses about the effects of many of the variables on responsiveness to courses in driver education. As has been pointed out earlier, many of the tasks are advisory rather than compulsory and it may be these taks which are critical for safety. Techniques of attitude change depend on the assumption that changes come out of conflict, discrepancy, inconsistency or discontent with the status quo. Formal education seeks to create a discrepancy between where the individual is and where he ought to be to gain approval, avoid punishment and, above all, be rational.

These objectives and the course content in turn suggest several different

types of criteria - namely those for assessing the degree to which the students have acquired the knowledge taught in the classroom, the psychomotor skills taught in the car and the ability to perform the kinds of practices taught in the classroom. Although the major interest is in safety as reflected negatively in accident rates, it is assumed that safety will be affected through these mediating practices, although the value of these practices in reducing the frequency and severity of accidents has never been demonstrated. Logically, the use of these kinds of criteria requires two experimental groups whose learning performance can be closely monitored, one which received classroom instruction as well as in-car instruction and one which only received the in-car instruction. Otherwise, it cannot be known whether an effect derives mainly from the classroom tuition, the in-car instruction, or some combination of both. In addition, some procedure is required to validate these driving practices against accidents.

Thus it can be seen that an evaluation of driver education requires an assessment to be made in terms of traditional educational criteria, namely formal tests, secondly in terms of training criteria, i.e. the acquisition of skills, thirdly in terms of the relationship between the two types of criteria, fourthly in behavioural terms, i.e. driving practices and proficiency measures after the initial acquisition of knowledge and skills and ultimately accidents. If such courses are to be justified in terms of safety, it implies that some study must be made of the interrelationships between these various criteria.

This procedure is necessitated by the nature of the ultimate objective, namely safety. Safety is assumed to constitute an indirect or negative measure of safety - safety in other words is indicated by the results of its absence. An accident may be defined as certain types of outcome of a collision between two objects in the road transport system which result in damage to property and/or injury to a road user. Thus accidents are defined by their outcomes rather than their antecedent behaviour. They belong to the wider class of collisions. Various factors such as energy absorbing bumpers, seat belts, efficient ambulance services, an unoccupied vehicle, may in fact prevent a collision from being classified as an accident, because they reduce the consequences of such a collision. Since on the one hand, this study is an attempt to monitor the growth of knowledge as reflected in the young drivers' activities on the road, and on the other hand, the assumption is made that unsafe practices on the part of a road user will lead to an accident, these considerations lead to the use of collisions rather than just accidents as a criterion for safe practices. Even this criterion cannot be viewed as a representative sample of safe practices in a study which is concerned with the behaviour and activities of a driver on the road, but rather as an intermediate criterion for the ultimate criterion - namely safe i.e. risk free driving practices.

An interesting study showed a fairly constant ratio of serious conflicts to injury accidents at intersections with fast moving traffic carried out at The Transport and Road Research Laboratory (1971 and 1972), although the method of assessing the severity of the conflict is not defined. It is a point worth noting that despite the fact that accidents belong to the wider class of conflicts, the justification for such studies is that it may permit research workers and engineers to use the frequency of occurrence of serious conflicts as an "intermediate" criterion of safety in place of the less frequently occurring accidents. The apparent paradox is resolved by viewing conflicts and accidents as members of the same series, namely unsafe driving practices.

The use of accident records as the criterion of safety involves several assumptions; that the accident is in fact reported and there are no systematic biases in the accident reporting procedure; that it is known whose behaviour is represented by the effects observed and that these results could have arisen only from behaviour as such. In the case of the latter, it is usually very difficult to accurately reconstruct the events leading up to an accident and so determine the degree to which its cause was behavioural or due to some other factor in the car/road/driver/traffic system.

Thus one of the problems of evaluating driver education is that driver education is designed to achieve specific behavioural objectives and yet has never been evaluated in behavioural terms since accident records do not constitute behaviour. This therefore presents the evaluater with an acute conflict. Previously the conflict between evaluating the course in general terms and in terms of safety was mentioned with respect to the different strategies imposed by the purpose of the evaluation. There is now a further problem, the strategy required to evaluate the course in terms of safety. It requires a test of behaviour which in contrast to the accident criteria which would involve a direct measure of safety as reflected in the standards of performance in terms of which it is defined. In practice, bearing in mind the length of time to design, validate and carry out such tests, the advantages of using more readily available data are obvious.

The research journals contain many articles which purport to show the relationship between training and safety. Goldstein has outlined the findings and reviewed the weaknesses of these studies (1969 and 1971). It is not proposed to repeat this here but merely to say that it is difficult to make a judgement regarding most of the studies. Most of them are characterised by a lack of explicit statements on the assumptions used, hypotheses to be tested and methods employed. The super abundance of research at this primitive level tends to imply that the overall strategy of research errs in presenting the mere existence of a statistical relationship (its substantive meaning is never examined). Ideally the construction of scientific theories to cover broader fields is based on the synthesis of the separate research results in this field. A coherent synthesis cannot be forged from a collection of relationships between ill-defined variables of unknown strengths and magnitudes. The necessary conditions for a synthesis include an evaluation of the results available in the field, a coherent interrelating of the magnitudes found in those results and in the construction of models based on those magnitudes which permit effective countermeasures to be conceived and introduced. However, these investigations do not permit such a synthesis.

Goldstein and others, in their reviews of the evaluation studies of driver education, have avoided discussing the outline, content and methods of driver education. Most studies say very little about the variable under study, namely driver education. There has been little discussion by educational psychologists about the nature of the knowledge, skills and attitudes which are to be taught in the classroom, their relationship with the practical task of driving and the methods which can be used to help the novice driver acquire the appropriate knowledge, skills and attitudes. Risk (1973) has compared the aims and objectives of the classroom phase of the course with the in-car phase. But there has been little discussion of the methods that can be used. Most of the studies that purport to compare different methods are usually comparing different aids e.g. driving ranges or simulators, or different lengths of course - particularly with respect to the in-car instruction. These 'methods' are usually taken as given and their contents are never specified in detail. The whole field of curriculum development based on the research evidence as it relates to safe practices and driving and to techniques of persuasion appears to have been ignored until fairly recently.

Most of the resource material used in the United States appears to take the form of information pamphlets issued by various interested parties. Few very thorough manuals for driving instruction exist, although Anderson's "In-car instruction - methods and content" (1968) is a notable exception.

This omission is inevitable given the belief in the empirical theory of knowledge. The classical empirical tradition viewed the acquisition of knowledge as the obtaining of information through the observation of the environment. If so, our knowledge can be thought of as a result of an interrupted series of 'bits' of learning. One central idea is that the function of the cognitive mechanisms is to submit to reality, copying its features as closely as possible so that it may produce a reproduction which differs as little as possible from external reality. The idea of empiricism implies that reality can be reduced to its observable features and that knowledge must limit itself to transcribing those features rather than explaining them or changing them. Clearly then, such a passive theory of knowledge does not explain the guidance property of knowledge that will lead the driver to change his actions continuously, thereby altering other people's reality as well as his own.

There are several fundamental difficulties with this view. Biologists have shown that the relationship between an organism and its environment is one of constant interaction.. The view that the organism submits passively to the influence of its environment has therefore become untenable. Man, as a knower, cannot simply be a recorder of outside events. Such a view of knowledge fails to explain mathematics which clearly escapes the constraints of outer reality and deals essentially with unobservable features and cognitive constructions in the literal sense of the word. Man's essential characteristic is that man acts upon his environment and modifies it by his work, thereby gaining a deeper understanding than reproductions or copies of reality can ever provide. Most social and physical research clearly show the obtrusive effect of the observer and his measurements. Plaget showed that cognitive activity has structural properties - that certain cognitive structures underlie the thought processes at different levels of development.

Since knowledge is assumed to be a series of bits of information and education is the medium through which this information is conveyed, the evaluators of driver education have been content to view it in terms of a simple input-output model and have therefore failed to contribute anything to the development of curricula or to account for their findings. By concentrating solely on its effect on the frequency of accidents, the evaluators have ignored other effects even though they are relevant, directly or indirectly to the criterion under investigation.

In recent years, studies have been mounted, often in response to demands for more cost-effectiveness to be demonstrated, of different aspects of instructional method e.g. Schuman et al's pilot study of the use of workshop discussions for young drivers (1971), and Pelz and William's study (1974) of a larger scale implementation of some of the ideas of the pilot study, Pain's study (1973) of training programmes for young qualified drivers, and Jones' study (1973) of the relative merits of the in-car phase of driver training (driver education referring to the classroom phase only) by public i.e. school instructors and the commercial instructors. But despite this increased attention given to the content of instruction, the assumptions are never made explicit and the questions of transfer and integration of the two phases of driver education are not raised.

In addition, increased attention has been given via licence renewal procedures as in California (Coppin et al, 1967) and Oregon (Kaestner, 1967)

to the question of giving further tests or instruction (driver improvement) to those drivers with an accident record. Attention is now being given to driver improvement courses for the "unexceptional driver". Driver improvement and the research relating to it will not be reviewed as it has been done elsewhere (Klein, 1970 and Schuster, 1971), but similar assumptions are involved in such programmes and the literature is not characterised by a discussion of the relationship between attitudes, formal knowledge and the practical activity of driving. Some of the techniques are typically no more than exhortatory appeals to drivers. As there is no discussion of the underlying theory which may account for the claims of effectiveness based on a variety of criteria of these different techniques, nor is any attention given to the possibility of other variables accounting for the observed differences, it is difficult to interpret them. Thus the efficacy of such programmes remains in question.

The subject of this study is the extent to which self-report data relating to driving, accidents and prosecutions for traffic offences collected during this investigation can serve as evaluative criteria with respect to classroom and in-car training objectives. It is not suggested at this stage that these data by themselves permit any valid inferences about safe practices as such. However since accidents are assumed to be related (inversely) to safety, this aspect of the study of driver education is concerned with its evaluation in terms of safety.

Other reports have already been published by the Road Safety Research Unit at Salford University which have tried to evaluate in educational and behavioural terms the courses of driver education introduced into the sixth form curriculum. Those aspects of subsequent experiences which have been examined are young people's patterns of interaction with the car, i.e. the decisions to drive, when to drive, whether to wear seat belts or not etc. and the extent of their driving knowledge. Driving proficiency and safety as reflected in accident frequencies are the subject of further reports.

The assumption is made that accidents and traffic offences are related directly or indirectly to safety and the hypotheses to be tested are that they are amenable to the persuasive influences of the course in driver education. As has been stated before, the strategy for evaluating the course in terms of safety requires a test of behaviour which would involve a direct measure of safety as reflected in the standard of performance in terms of which it is defined. In practice, because of the difficulties in designing, validating and carrying out such tests, recourse is had to more readily available data such as accidents.

Any statement about the criteria used to evaluate courses in driver education in the context of road safety immediately poses questions about the validity and reliability of these criteria. Validity is a complex issue to explain and has several meanings. "Conceptual validity" implies that the treatments, observations and measurements made by the experimenter are adequate concrete representations of the broader abstract class about which the experimenter really wants to learn. In this study, the courses in driver education actually given to the students approximate very closely with what is known as driver education, albeit in a somewhat different form to suit this country. Facilities and techniques were used which could very easily be used by other schools which wished to introduce driver training. In other words, it was fairly representative of what could be achieved in schools without undue expense.

However, there are great doubts about the conceptual validity of accidents as a measure of driving performance. Despite the tragic aspects of accidents, accident occurrence is a relatively rare phenomenon in relation to the

amount of mileage covered. To illustrate the diluting effect of other factors in a potentially accident producing situation, let us assume that a driver is about to overtake another car on a bend. If an oncoming vehicle is just around the bend, the possibility of an accident is great. If, however, the oncoming vehicle is about 100 yards down the road, a dangerous situation might develop which would result in a "near miss" depending on the relative speeds of the vehicles and width of the road. If the oncoming vehicle is further back or there is no oncoming vehicle, the probability of a collision would be zero. In all three situations, the common factor is the dangerous practice of overtaking on a bend. Because of "chance", a collision is the least likely of the three. There are many more "near misses" than accidents. In the absence of a known constant ratio of "near misses" to accidents, the number of accidents per person is not proven to be a good index of a person's safe driving performance.

This doubt also applies to traffic offences. The probability of being caught speeding is relatively low. More important, it varies with the time of day and the type of road used. Ideally, what is required is a specific set of operations which anchors the concept (of safe driving) to events in the real world, but is at the same time as pure an instance of the concept as possible. But in practice, accidents and traffic offences are usually the only indicators of driving performance that can be obtained for the subjects in a large sample.

Predictive validity describes the condition in which one may predict from knowledge of a specific behaviour a second, operationally different but conceptually related, behaviour. For example, will it be possible to predict the subject's driving performance (as measured by his accident rates) from his score in the end of course knowledge test? The conceptual validity of the driving knowledge test may be accepted but its predictive validity as a criterion will have to be assessed.

"Concurrent" validity of a criterion - namely, that it measures what it sets out to measure - can be assessed by finding out whether the criterion, in this case accidents, gives the same answer as another independent source of information. If accidents are valid criteria, one would expect them to be related to other indices of driving performance. Again, good evidence on this is lacking.

There is another aspect of the concept of validity which must be considered; whether the answers to questions e.g. number of accidents, vary. For example, do the experimental group, knowing that they have been taught to drive as safely as possible, feel that they are, therefore, expected to be safer and, therefore, answer that they have not been involved in an accident, whereas the control group, not perceiving a need to pretend, answer truthfully that they had had an accident. The existence of a systematic error such as this would bias the answer in a given direction. Systematic errors may be minimised by using carefully controlled procedures and a system of double checks.

Another guide to the usefulness of an evaluation criterion is whether the obtained relationship is a reliable one. Reliability, when used in this sense, can be equated with consistency or stability. Will the response measure yield the same value on repeated occasions if the stimulus conditions are the same, or can the same results be obtained under different but similar circumstances of testing? Since accidents and traffic offences are not behaviour but certain specified outcomes of behaviour, this condition cannot be met. Indeed studies that have been made of accident proneness, the stability of an individual's accident record over time and the relationship between accidents and mileage suggest the contrary, i.e. that accidents, as they befall an individual, are not events recurring in a constant fashion

over a given period. Although there are numerous such studies, the conclusion is never explicitly stated that the use of accidents in relation to an individual driver (as opposed to a particular road or traffic configuration) as a criterion is of little value and yet implicitly this appears to be the major conclusion that can be drawn about its usefulness.

In addition, these criteria (accidents and traffic offences) should have curricular validity, i.e. they should be related to the objectives and content of the course. In this context, therefore, it can be said that the use of traffic offences as criteria is justified. Insofar as the course is based on the legal requirements and procedures laid down in the Highway Code and traffic offences represent infractions of those requirements, they constitute evidence as to the extent to which drivers are responding to the appeals made to obey the rules and procedures.

Thus while it is clear, even at this stage, that accidents and traffic offences do not possess all these characteristics, since the purpose of the study as originally conceived was to assess the part played by training in accident causation, an attempt will be made to assess their usefulness and to examine the size and nature of the differences between the groups with respect to these criteria.

CHAPTER THREE EXPERIMENTAL DESIGN

The purpose of the study was to assess the effectiveness of courses in driver education in the context of road safety. In order to do this, it was decided to set up an experiment to test the hypothesis that students who receive a course of driver education in the sixth year of grammar school will have a similar driving record to those who have not received such a course. Two groups of young people were selected. The research procedure has been outlined extensively elsewhere (Jolly, 1972; Shaoul, 1972 and Raymond et al, 1973), it is not intended to repeat this here but to clarify various points.

3.1 The implications of a non-randomized sample

The logic of a truly experimental design implies a randomized sample i.e. random sample selection from the particular population and random assignment to the various groups. Such randomization is rarely possible to achieve in the social sciences. In choosing a quasi-experimental design, the extent to which it approximates to true experimentation is crucial. Campbell and Stanley (1966) discuss the factors affecting internal and external validity of quasi-experimental designs. Internal validity may be defined as the basic minimum without which any experiment is uninterpretable and includes the concept of reliability. That is, did the experimental treatments make a difference in this specific experimental situation. External validity is concerned in the problems of generaliseability, i.e. to which populations, settings, treatment and measurement variables may the results be generalised. It is therefore imperative to select designs which are strong in both kinds of validity.

Campbell and Stanley discuss seven different classes of variables relevant to the internal validity of the experiment which, if not controlled by the experimental design, might produce effects confounded with the effect of the experimental stimulus. These eight classes of variables are considered here as they affect the design of the experiment to investigate the effects of driver education.

The first variable which a quasi-experimental design must consider is history, i.e. the specific events occurring between the first and second sets of measurements in addition to the experimental variable. This is important because of the long term nature of the research. Although the sample were recruited over a three year period within each year, approximately half were assigned to each of the major groups, thus the historical events occurring between the experimental variable - i.e. training, and subsequent observations can be assumed to be broadly similar for the various groups as a whole. But clearly changes in their life style e.g. moving away from home, becoming a student, getting married etc., may have an important effect on the kinds of activities which may be related to accidents. Relevant to this variable is the concept of experimental isolation, the employment of experimental settings in which all extraneous stimuli have been removed. Thus the basic assumption is that the environment is sufficiently intransigent to permit the experimenter to have complete control. This may be tenable in the physical and biological sciences but is unlikely to be so in the social sciences.

Maturation is also cited as being a critical variable. These are the processes occurring within the respondents operating as a function of the passage of time per se, but not particular to the events. These include growing older, hungrier, more tired etc. Age is known to be related to accidents and is in fact one of those variables whose effects on accidents are to be closely monitored. But presumably if age is important in accident causation for this particular age group, it is the behavioural patterns associated with each age range rather than the physiological effects as such which are important.

There is a third source of variation that could explain the difference between the groups, without having recourse to the effect of the experimental stimulus. This is the effect of testing itself. It is often true that persons taking a test for a second time have scores systematically different from those taking the test for the first time. This is indeed the case for intelligence tests. Webb et al (1972) stresses the importance of the distinction between reactive measures and non-reactive measures. A reactive measure is one which modifies the phenomenon under study, which changes the very thing that one is trying to measure. In general, any measurement procedure which makes the subject self-conscious or aware of the fact of the experiment can be suspected of being a reactive measurement. Whenever the measurement process is not part of the normal environment, it is probably reactive. There is evidence to suggest in the field of opinion and attitude research, that the intensively developed interview and attitude test techniques must be rated as reactive. In this study, reactive techniques have been used to collect information of a chiefly factual nature from the subject.

Instrument decay provides a fourth uncontrolled source of variance which could produce group differences that might be mistaken for the effect of experimental variables. For the social sciences, it becomes particularly acute when human beings are being used as part of the measuring apparatus as judges, observers, coders etc. Thus the groups may differ because interviewers have become more experienced, more fatigued etc. Ideally, when different observers are used, a sampling equivalence of interviewer is required, with the N being the N of interviewers, not interviewees. Again, this condition could not be met, since interviewers were allocated on the basis of geographic location, times at which they were available etc., in order to minimise costs in such a large scale survey.

A fifth variable which may confound the interpretation of results is statistical regression. This occurs when one of the groups under investigation have been selected on the basis of extreme scores on the criterion variable, e.g. a study of high accident repeaters with non-accident involved drivers. In general, regression operates like maturation in that effects increase systematically with the increase in the time interval between the sets of measurements. However, this is one source of variance which has been eliminated by the particular quasi-experimental design employed.

A further source of variance are biases resulting from differential selection of respondents for the comparison groups. This type of design is very prevalent in the social sciences. It will be recognised as one form of the correlational study. If the scores on the criterion variable differ, this difference could have come about through biased selection or recruitment of the persons making up the groups. i.e. they might have differed anyway without the effect of the experimental variable, (Conger et al, 1966; McGuire & Kersh, 1968). Frequently exposure to driver education has been voluntary and the two groups have an inevitable systematic difference on the factors determining the choice involved, a difference which no amount of matching can remove. Evidence has been present that suggests that although there is no volunteer bias, groups within the girls' sample may not be perfectly matched with respect to socio-economic status, a key variable albeit a summary variable, and that the groups within the boys' sample differed with respect to the number of people whose father replied. However no significant differences were revealed with respect to socio-economic status. Thus although great care was taken to eliminate one source of bias, another one had not been removed.

A seventh variable confounded with the effect of the experimental variable can be called experimental mortality. Even if equivalence was assured at some prior time, there may be differences at a later stage not because

individual members have changed, but because a biased subset of members have dropped out. This becomes a real problem for experiments carried out over a long period of time. If the experimental groups do not differ in the number of lost cases, the experiment can be judged to be internally valid on this point, although mortality reduces the generaliseability of effects to the original population from which the groups were selected.

Even within the ideal experiment in the classical tradition, a serious imperfection has been noted known as the interaction effect of testing. In the terminology of the analysis of variance, the effects of history, maturation and testing, as described so far, are all main effects, manifesting themselves in mean differences independently of the presence of other variables. They are effects that could be added onto other effects, including the effect of the experimental variable. In contrast, interaction effects represent a joint effect, specific to the concomitance of two or more conditions, and may occur when no main effects are present. Applied to the testing variable, the interaction effect might involve a shift due solely or directly to the measurement process, but rather a sensitisation of respondents to the experimental variable so that when the experimental variable was preceded by a pre-test measurement, there would be a change, whereas both experimental variable and the observations would be without effect if occurring alone. In terms of the internal and external validity, this design is internally valid, offering an adequate basis for generalisation to other sampling equivalent pre-tested groups. But it has a serious and systematic weakness in representativeness in that it offers, strictly speaking, no basis for generalisation to the unpre-tested population. It is usually the unpre-tested larger universe from which these samples were taken to which one wants to generalise. It is often known as the Hawthorn effect, after the well known experiments carried out by Elton Mayo (1933). In principle, it seems likely to apply in this study, since the subjects were told they were taking part in such a study. Since they were to be contacted at regular intervals, there was no way of avoiding this.

Another problem, typical of advance in science, is that soon we are no longer interested in the fact of effect or no effect due to the experimental variable, but want to specify degree of effect for varying degrees of the experimental treatment. Often different treatments are all given to the same group, each group receiving the treatments in a different order. But where one wishes to generalise to the effect of each treatment occurring in isolation, such designs are not appropriate because of the sizeable interactions among them as repeatedly demonstrated in learning studies under such labels as pro-active inhibition and learning sets. Logically, however, a study such as this relating to the problem of transfer, several counterbalanced multi-treatment (i.e. classroom and practical instruction, classroom alone and practical instruction alone) arrangements are essential, if the nature of the problems are to be elucidated. Once again, the experiment as designed, did not permit this.

Research of Hovland and others (1949 and 1953) have indicated repeatedly that the longer range effects of persuasive treatments (and to a certain extent driver education can be seen in this light) may be qualitatively as well as quantitatively different from immediate effects. These results emphasise the importance of designing experiments to measure effects after extended periods of time. To counteract the effect of repeated measurements of the same persons which cannot be trusted if a reactive measurement process is involved, Campbell (1972) suggests additional groups in the follow up period. Without this, the effects of intervening history, maturation, instrument decay, regression and mortality may be confounded with the delayed effects of the experimental variable. This, with the benefit of hindsight, would not have been difficult to do, given that the classes were taken as units and previous

years' classes could have provided control groups.

There are further problems of representativeness, namely the interaction effects of selection. Even though the true experiments control selection and mortality for internal validity purposes, these factors have, in addition, an important bearing on representativeness. There is always the possibility that the obtained effects are specific to the experimental population and do not hold for the populations to which one wants to generalise. Defining the universe of reference in advance and selecting the experimental and control groups from this at random would guarantee representativeness if this were ever achieved in practice. But inevitably, not all those so designated are actually eligible for selection by any contact procedure. For example, we are particularly interested in training young drivers. Yet only about 30% young people stay on beyond the minimum school leaving age, i.e. are still at school at the minimum licensing age. Under such extreme selection losses, it seems reasonable to suspect that the experimental groups might show reactions not characteristic of the general population. Even reducing the generalise-ability of the study to sixth formers in the U.K., it is not clear the extent to which the conditions found in the North Manchester area can be generalised to areas in the U.K., other than similar industrial areas. In addition, the lengthy period of the follow up studies makes it likely that some respon-dents will be lost thereby making the experiment less representative of the original universe.

The nature of the study entailed possible reactive arrangements, i.e. the subjects knew they were taking part in the study and the purpose of the study. This awareness can have an interactive effect, creating reactions to the treatment variable which would not occur without the awareness. Such effects limit generalisations to respondents having this awareness and preclude generalisation to the population encountering driver training with non-experimental attitudes. The direction of the effect may be one of negativism, but seems more likely to be one of co-operative responsiveness in which the subject accepts the experimenter's expectations and provides confirmation. The problem of selection biases argue against using natural pre-assembled groups such as classes, but the problem of reactive arrangements argues for such use.

Once the internal validity has been established, after a dependable effect of the experimental variable upon the criterion variable has been found, the next step is to establish the limits and relevant dimensions of generalisation not only in terms of populations and settings but also in terms of categories and aspects of the experimental variable. The actual experimental variable in any one study is a specific combination of stimuli, all confounded for interpretative purposes, and only some relevant to the experimenter's intent and theory. Logically this implies designing a course around a set of ob-jectives which can be measured in behavioural terms and specifying which part of the course is aimed at achieving a particular objective. For example, it may be in a course of driver education that it is desirable to inform the subjects of the benefits of wearing seat belts and to persuade them to do so, or of the legal necessity of taking insurance cover or of the practical necessity for looking in the rear-view mirror before changing lanes in order to ensure that they do so at all times. Several methods may be used to achieve a particular objective. Consequently, further study should be designed to refine the experimental variable, to discover that aspect of the original conglomerate, namely driver education, which is responsible for the effect. Representative sampling of driver education is as relevant a problem in linking experiment to theory as is the sampling of respondents and is an issue which has largely been ignored in the context of driver education - as indeed have most questions relating to the nature of the experimental variable itself (as opposed to sampling problems, volunteer bias, surrogate criteria etc.). To define a

category of driver education along some dimension e.g. the provision of information which may affect deliberate decisions which may affect safety made before entering the car - such as whether to drive at all, route to be taken, etc., and then to sample driver education for experimental purposes from the full range of stimuli meeting the specification while other aspects of each specific stimulus complex are varied, serves to untie or clarify the defined dimension from others, lending assurance of theoretical relevance. The placebo problem can be understood in these terms. The experiment without the placebo demonstrates that some aspect of the total stimulus complex has had an effect. The placebo experiment serves to break up the experimental variable into the suggestive connotation of pill-taking and the specific pharamacological properties of the drug - separating two aspects of the treatment previously confounded. Consequently, once recurrent unwanted aspects of complex treatments have been discovered for a given field, control groups especially designed to eliminate these effects can be employed.

Given the confusion in the research literature generated by the heterogeneity of results from studies on what is nominally the same problem, namely driver education and accidents, but varying in implementation, it is necessary to make it clear precisely what was the nature of driver education, i.e. the experimental variable. The course itself is outlined elsewhere by Jolly (1972 and 1975) and the assumptions of such a course are discussed by Risk (1973).

The research design employed in this study is a non-equivalent control group design. This is one of the most widespread designs in the social sciences and involves using at least two groups which are given pre-tests and are subjected to subsequent observations aimed at assessing the effect of the experimental variable. The groups do not have the pre-experimental sampling equivalence ensured by random sampling - rather they constitute such naturally assembled collectives such as classes, as similar as availability permits but yet not so similar that one can dispense with pre-tests of equivalence on relevant variables. The assignment of the treatment variable to one group or the other was under our control. Thus there is one major point about the study to be considered for its implications. The subjects are not assigned randomly to each group. The more similar the two groups are in their recruitment and the more this similarity is confirmed by the scores on the pre-test, the more effective this control becomes in reducing the equivocation in interpreting the results. If this is so, we can regard the design as controlling the main effects of history, maturation, testing and instrumentation in that the difference obtained between the groups cannot be explained by the main effects of these variables such as would be found affecting both groups.

An effort to explain away a difference specific to the experimental group in terms of such extraneous factors as history, maturation or testing must hypothesize an interaction between these variables and the specific selection differences that distingish between the two groups, i.e. location, housing conditions, religion. The hypothesis of an interaction will not usually be tenable where the groups are identical in pre-test scores. Although some doubts exist about equivalence of the groups with regard to socio-economic status and car availability, from direct evidence and different response rates, the groups appear to be similar with regard to pre-course knowledge relating to driving.

This discussion has attempted to outline some of the ways in which this 'experiment' to evaluate driver education differs from the classical experiment. Several of these departures raise problems relevant to the validity of the experiment. In the social sciences, one rarely has complete control in the Fisher tradition. Consequently it is particularly important that

the researcher is aware of the specific variables which his design fails to control so that alternative hypotheses may be selected and tested in an attempt to arrive at some conclusions about the nature of the relationship between driver education and accidents.

3.2 Sample equivalence

All the pupils exposed to the course received the same sequence of classroom lessons from the same teacher. The use of car instructors who had had similar training, the curriculum, and the initial use of a standard driving range had the advantage of establishing some control over this phase of the course. Apart from the question of the degree of control successfully attained by these measures, it remains true that it is pertinent only to two of the three major elements, i.e. teacher, course and pupils. The most effective measure of experimental control involves the random allocation of subjects to the experimental treatments. Thus since the method of subject recruitment and allocation which was used departed from this random model, it was necessary to make checks on sample equivalence.

1800 boys and girls were recruited over a three year period during their sixth year at grammar school, when they were about 16 - 17 years of age. These young people were allocated to the various experimental groups, namely pre-driver training where the amount of in-car training is limited to a few hours of driving on the public roads, full driver training with 15 hours of in-car training and simulator aided driver training supplemented by a few hours of in-car instruction on the public roads, or to the control group by the research team according to their school and the year they were recruited. Therefore it might be assumed that since the pupils in each school were assigned in alternate years to the experimental and control groups, this gave some assurance of group equivalence. However, the balancing effects can only be achieved if any differences initially existing between the schools, in terms of socio-economic and other background characteristics, remained constant over the three year experimental period. Again, it should be borne in mind that the comparisons to be made between the subjects will not simply be between the total in each group of the experimental design. Modifications of the composition of a group may be enforced by the need to ensure equivalence in terms of the numbers of subjects who possess a current driving licence, the number regularly driving, owning a car etc.

Earlier it was pointed out that randomness would in principle provide groups which are equivalent in terms of all relevant variables before and therefore after experimental treatment. Logically therefore these variables would include the parameters associated with exposure rates, as well as those just mentioned. The exposure data already available from the Salford experiment however (Raymond et al, 1973 and Shaoul, 1975) provides some confirmation for the results of some previous work by McGuire and Kersh (1968) and suggests that one effect of the course is to lower the mileage-exposure of those exposed to it. It is not known where this effect derives mainly from the classroom tuition, the car instruction or some combination of the two. Possibly the dangers of bias which may result from the different exposure rates, would have been eliminated and recognition been given to the important role occupied by class work in this form of driver preparation and had another experimental group subjects been provided with some in-car instruction only, in an attempt to identify the relevant part of the course which caused this.

From these comments it is evident that equivalence checks will need to be made for each comparison undertaken and that the composition and numbers of groups cannot be precisely decided at this stage. Hence during this phase of the study, tests can only be made in terms of formal experimental design, i.e. comparison between experimental and control subjects within and between years.

In principle, the range of variables used for matching purposes can be seen to be very large indeed. This arises out of the fact that behaviour in relation to the car can be considered as part of the wider matrix of social behaviour within which it is embedded at the institutional level of the family, for example, it is likely that the quantity and quality of a young person's driving exposure will be heavily influenced by whether or not he is allowed access to a car owned by his parents. Other background variables may operate more subtley to determine the relative degrees and kinds of knowledge, skills and attitudes possessed by the pupil at the time he is enrolled in the course.

In practice, it has been useful in social experimentation to consider only those variables thought to be most generally relevant to the criteria under study. This procedure was followed also in the present case, the variables selected focusing upon socio-economic status, parental education, parental driving qualifications, car ownership/access and number of car drivers in the family. Significance testing of the differences existing between groups within and between years, confirmed the departure from randomness which could be expected in a quasi-experiment. Not all of the logically possible tests were carried out, due in some cases to inadequacies in the data available, but some conclusions can be drawn despite this.

The results are quoted more fully elsewhere by Raymond et al (1973) and Shaoul (1972), but the data as a whole highlight the importance of testing the boys and girls separately. The boys and girls show marked and consistent differences in homogeneity with respect to the seven variables tested. Thus of 39 difference tests, 15 achieved statistical significance in the case of the girls' groups, and 4 in the case of the boys'. Considering only those comparisons made within years, the figures were 5 and 2 respectively.

The relevant years and variables for the boys' groups were the number of fathers who owned the car they usually drove (1970-71) and the number of families with one or more licensed drivers (1969-70). If the data are combined for the three years, only the first of these two remain significant, though this is now at the 1% level. When the four variables relating to car ownership are considered, there are no significant differences if the experimental and control subjects are combined for the first two years (1968-70), nor if the three years control subjects are compared with the experimental groups (1968-69) and (1969-71).

The picture is more complicated for the girls' groups. For the first year three variables showed significant differences, and the second year two variables. Combination of the data for the two years revealed three variables which were significant, two of them at the 1% level. If the data are combined for the three years, all these differences vanish, though again if experimental and control subjects for the first two years are compared with those for the third year, three differences prove significant.

In both cases then (boys and girls), it appears that comparisons of experimental and control subjects are reasonably secure after the data have been appropriately combined. However when it is considered that it may be subsequently important to make distinctions between the groups (e.g. between pre-driver trained (1968-69) and fully trained students (1969-71)), it clearly becomes necessary to make a more detailed appraisal of the data.

It needs to be remembered too that where the data have been combined and compared for the three years, only four variables were involved, due to gaps in the data available. That such gaps may be potentially serious is suggested by the data for the girls' groups in particular. For example, the variable of socio-economic status is known from other studies to be related

to accident rates (Conger et al, 1966; McGuire & Kersh, 1968) and the girls in the present study exhibited significant differences in the three comparisons in which it could be included. In any event, it is clear that the differences which were found re-emphasise the necessity to carry out further checks once the composition of the groups, whose accident data are to be compared, is known.

Comparisons between the groups at later stages in the follow up studies were made with respect to socio-economic status and car availability. Both of these variables were shown to be associated with the decision to learn to drive, to qualify as a driver, to drive once a qualified driver and to account for the variation within the groups of the proportion of drivers who actually drive. The sample's own occupational status (whether or not they were in full-time employment) was also an important factor in determining the extent to which they drove. Not only did it provide some explanation why qualified drivers did not in fact drive at all for some groups, it was also related to their weekly mileage. In addition, occupational status was important in determining the purpose of most of the trips made and consequently, the extent of night driving. The ownership of the car the driver usually drove determined to a large extent, its car size, engine capacity and age. It was suggested that these variables affect both the opportunity to drive and the motivation to drive, i.e. the nature of the variables are such that one has to go outside the data to explain these findings. Consequently these suggestions as to the operations of the variables can only remain as untested hypotheses.

Despite the fact that the groups differed with respect to whether they drove and how much they drove and this was found to be related to occupational status and car availability within the groups, there were no substantial differences within the boys' drivers groups or within the girls' groups with respect to these variables. It is therefore, in the context of the discussion of the implications of a non-random experimental design for sample equivalence, noteworthy that the homogeneity of the sample with respect to socio-economic status and car availability increases as their interaction with the car increases. The data already available in the report by Shaoul (1975) suggests that there are no longer any substantial differences with respect to these variables, when only the groups of drivers, i.e. the only people who can be involved in road accidents as drivers, are compared. Thus, the initial problem has been self-correcting.

3.3 Methods of data collection

In order to assess the effects of a course in driver training, accurate histories of the students in both the experimental and the control groups were required over as long a period as possible after the completion or non-completion of the course. The sort of information that is required is whether or not they passed the test, and if so, whether they actually drive, their annual and weekly mileage, proportion of night and motorway driving, whether or not they wear seat belts, whether they have had any traffic offences or accidents, and similar details about their motor cycling. Sources of information about accidents are the police, insurance companies, garages and the motorists themselves. These sources all have advantages and disadvantages.

Details of accidents could be obtained from the police, but this would entail contacting the police forces throughout the country and would only reveal information about accidents which had been reported to the police and would not therefore include the minor accidents which are in the majority and are not by law required to be reported. Similarly details of traffic offences could in principle be obtained from Magistrates Court records, but again this would be impracticable since it would involve a search throughout the country. Nevertheless, these sources could be used as verification for

information obtained from other sources.

It has always been assumed by people who use police accident records that while they may not include all reportable accidents, the missing data were not biased in favour of any one group of drivers or type of accident. However, McGuire and Kersh (1968) found that after obtaining by interview a complete accident and violation history of 500 people in Mississippi, the motor vehicle records of the Mississippi Highway Patrol were searched and comparison made between the information obtained by the two methods. It was found that 52% of all legally reportable accidents ($50 or more and/or personal injury) admitted by the respondents were in the official records but distinct biases of sex, age and occupation were noticed in the missing data. However, one explanation for this may be that since any accident involving personal injury or damage greater than $100 is required by law to be reported, and $100 in the US may be the cost of repairing the most trivial of bumps, the law is widely ignored. Since most accidents are very trivial, the law may result in under-reporting of accidents since people are unwilling to go to the trouble of reporting such trivial accidents. The authorities themselves may be very unwilling to take down details of such accidents.

Details of accidents could also be checked with insurance companies where they were known, with the consent of the driver. However in many minor accidents, the insurance companies would not be informed. Finally, there is a minority of drivers who do not insure their vehicles and in 1967 there were 117,558 offences or alleged offences of this kind in England and Wales (Home Office, 1968).

Garages could be expected to have useful data about accidents, since unless the vehicle was a write-off or received such minor damage as to enable the owner to repair it himself, a garage will be involved in repairing it. However even if it were known which garage each driver used (and this could be expected to change over time), it is unlikely that the garage would have any records of how the damage was incurred.

However since all the other information required can only be acquired from members of the sample themselves, it was decided to rely chiefly on the sample for all this information and where practicable verify it or a sample with some external source such as police and insurance records.

Although the driver is better informed about his driving history than anyone else, there might be expected to be some limitations about relying on him for this information, for example the accuracy of his memory, the degree of his honesty and his willingness to co-operate. Another limitation is the extent to which he is available to answer questions because he has moved, works odd hours, away on holiday or at University, or is ill.

In this study, it was decided to minimise inaccuracy due to forgetfulness by contacting the sample several times during the five year period, so that each contact with the respondent would elicit information concerning no more than nine months driving, but preferably six months.

Three methods were used to obtain information over the three year period.

1. Questionnaire administered to them as a group in school.
2. Postal questionnaire.
3. Interview.

Although each of the three methods was used to contact the sample at a particular time, if one method failed, another was used. For example,

those who did not reply to a postal questionnaire were interviewed, and those who were not at home for interview were contacted through the post. It was even possible to try all three methods to contact a person. If he was not in school for the group administered questionnaire and was away from home when an interviewer called, he would be contacted through the post. This it may be seen that these three methods were interchangeable and in particular the postal questionnaire and interview.

The group administered questionnaire has some of the characteristics of both an interview and a postal questionnaire. This technique was used only once for each sample. Since the majority of sixth formers stay on for a two year course at school, they are still at school for a full year after they had completed (or not completed) the driver training course. The opportunity was therefore taken to visit each school about four months (Figure 3.3.1) after the start of the second year in the sixth form. Each school made a forty minute period available for this purpose.

About fifteen to twenty minutes was spent explaining the purpose of the project, how the follow up studies were being conducted and the type of information that was required of them, with definitions where appropriate - for example, of an "accident" - since it had not been appreciated by the members of the sample that minor accidents were of interest for this research, and of "driving lessons" since most people seemed to consider that they were not "learning" if they went out driving with their father. Since their co-operation was required over a long period of time, wherever possible without influencing the nature of their responses, the relevance of each piece of information they were asked to give was explained. Questions were raised about certain aspects of the research project and answers could be given. Great stress was laid upon the confidentiality of all the information and it was made clear that nothing would be divulged to potentially interested parties. This was felt to be important since there had been so much publicity about misusage of data banks and other confidential information. The questionnaire they were to complete was explained.

The information required for each of the three methods used in the follow up studies is very similar. The students were asked to start off by filling in the white questionnaire (Appendix 3.3.1) on their driving (if any), and only to fill in the accompanying pink questionnaire (Appendix 3.3.2) for each accident they had had, and the yellow one (Appendix 3.3.3) for each incident which gave rise to one or more traffic offences (since it is not uncommon to be charged with more than one offence at the same time). The different colours were used to facilitate filling in the correct questionnaire and to avoid having one very long one inapplicable for the most part to most people.

If there were any difficulties in answering the questionnaire these could be dealt with on the spot. Similarly if any of the respondents had missed out a question which he should have answered, it was usually spotted when he handed it in and he was asked to complete the questionnaire. This method had therefore considerable advantages over a postal questionnaire but could only be used once since after the end of May in any school year, it is difficult to get all the upper sixth formers together because of examinations. Since not very many of them were driving at this stage and because they would be questioned several times in the next few years, it was decided not to jeopardise their co-operation by questioning them too often. It was also desirable for them not to associate the research project as being part of their school days only and therefore something to be discarded as soon as they left school.

This method was used to obtain factual information only, and to familiarise the students with the type of questions and the forms they would receive in the post. The basic questionnaire took at the most about five minutes to

	Jan	Feb	March	April	May	June	July	August	Sept	October	November	December
1969											1st follow up of 1st sample. group administered.	
1970		2nd contact of 1st sample - Interview							3rd contact of 1st sample Postal/Interview			
1971		1st contact of 2nd sample. Group administered/ interview		4th contact of 1st sample. Interview/ postal.					2nd contact of 2nd sample Postal/ interview			5th contact of 1st sample. Postal/ interview
1972		1st contact of 3rd sample. Group administered/ interview		3rd contact of 2nd sample. Interview/ postal.					6th contact of 1st sample. Interview/ postal	2nd contact of 3rd sample Postal/ interview		4th contact of 2nd sample Postal/ interview
1973				3rd contact of 3rd sample. Interview/ postal.		7th contact of 1st sample Postal/ interview		5th contact of 2nd sample Interview/ postal				4th contact of 3rd sample Postal/ interview
1974			8th contact of 1st sample Postal/ interview FINAL			6th contact of 2nd sample Postal/ interview FINAL		5th contact of 3rd sample Interview/ postal FINAL				

FIGURE 3.3.1 FOLLOW UP STUDIES PROGRAM

The primary method of contact is shown first, followed by the second method which is used for non-contacts.

complete. The form of the questionnaire is similar to that for the mailed questionnaire. It was typed onto 4 sheets of A4 and then reduced onto foolscap, 2 sheets per side. The print was small but it was felt preferable to being faced with a thick questionnaire.

About 10%, it varied from school to school, were not contacted in this way since they had either left or were absent from school for some reason, and these people were contacted personally at home where the follow up procedure could be explained in greater detail than in a covering letter of a mailed questionnaire.

Similar information to that obtained from the group administered questionnaire was required at later dates during the follow up period. To avoid the costs of interviewing and to maintain contact with the sample, it was decided to alternate interviewing with a postal questionnaire.

The three questionnaires (the white one on driving, pink one for accidents and yellow one for traffic offences), each reduced onto one sheet of foolscap to minimise bulk for posting, were sent out in the post with a covering letter and a stamped addressed envelope returnable to the University. The covering letter typed on University headed paper thanked the respondents for their previous co-operation, kept them informed of the progress of the research and gave brief instructions for filling in the questionnaire and returning it in the stamped addressed envelope provided. There is some evidence that a stamp fixed to the envelope is more effective than a reply paid envelope. The claim is that respondents do not like to see stamps wasted. Commercial advertisements are associated with reply paid envelopes, and there is a tendency on the part of many individuals to throw such envelopes away almost immediately (Goode and Hatt, 1952).

Two or three weeks after the questionnaires were sent out, a letter (personally addressed) was sent to those who had not replied, explaining that it was not too late to return the questionnaire if they had been too busy to do so before. Two or three weeks after this, a complete set of questionnaires and stamped addressed envelopes and covering letter were sent out to all those who had not yet replied. This method usually achieved a response rate of over 90%. Since this was a questionnaire to a pre-selected sample over a long period of time, it was felt that it was worthwhile to send out the third reminder as many had left home and the questionnaires had to be forwarded.

All comments and queries raised at the side of the questionnaires and all additional correspondence inserted in the returned envelope were always answered. Occasionally, the respondents had gone to the trouble of paying the return postage because a stamped addressed envelope had been inadvertently omitted. They were always thanked and received extra stamps as compensation. It was felt that it was vital to maintain their co-operation for such a long term project as this and that all reasonable means should be used.

Initial contact was always through the parents' homes since many of the sample moved far too frequently for records to be kept of their own addresses. Although it was always possible to check their last known address from the last questionnaire they returned, the master list of addresses was not updated unless the parental address changed.

In fact, because of the large slum clearance programmes being carried out by the local authorities, a proportion of questionnaires were returned by the Post Office or did not reach the sample because their homes had been demolished or were no longer occupied. In nearly every case, the local housing authority supplied the new address. So far, contact has not been lost with the parents' address in more than a very few cases.

The 10% or so who did not respond to the questionnaires were contacted by an interviewer. The professed reasons for non-response were usually absence from home, illness or no driving and therefore did not feel that the research team would be interested. A final 1 - 5% or so could not be contacted because they had left home or their exact address at the time was unknown. However this percentage, although a fairly constant figure for no contact at all, was not comprised of the same people every time. Contact was usually made on the next postal questionnaire or interview.

The quality of the response from postal questionnaires was usually very good. Additional comments were added at the side where the respondents felt that their circumstances were not otherwise adequately explained and short letters often accompanied the questionnaires. Occasionally questions were left out. A photocopy of the questionnaire with their answers was sent back to the respondent with a letter explaining that one or two questions or a whole side had inadvertently not been answered. This usually was completed and returned.

A postal questionnaire was also used to contact people who, when an interviewer had tried to contact them at home, were away or who had left the area. In any series of interviews of the sample, at least thirty could not be contacted at home for one reason or another. Usually the parents supplied a forwarding address. The interview schedule was re-designed for self-completion and sent with a copy of the accident and traffic offence forms and a covering letter to this new address. Again a very high response rate was achieved.

The interview was used to obtain several kinds of information - although not necessarily all at once. Firstly, to obtain the factual information requested in the postal questionnaire; secondly to discover their attitudes towards certain aspects of driving, and thirdly to administer tests of driving knowledge. The interview also enabled the research team to inform the sample of what was happening. It was also an opportunity for enlisting the support of the parents by a brief description of the research project. This was essential, since very often the parents acted as a filter through which contact had to be made - for example, by forwarding correspondence and by arranging a time when it would be convenient for the interviewer to call again and to speak to the respondents. They often ensured that he or she would be at home at the pre-arranged time. A team of interviewers was recruited to work for the University under the direct control of the research team. This, it was thought, would permit a greater degree of quality control and flexibility in the planning and execution of the follow up studies. Preference was given to those who had had considerable experience of interviewing with the more reputable companies and who had been trained. Extensive briefing sessions were held to ensure a certain degree of standardisation of interviewing techniques and to acquaint the interviewers fully with the nature of the project so that they would be able to assess the usefulness of the replies and to probe for further information where this was felt to be unsatisfactory. Each question on each of the three interview schedules was discussed. A set of written instructions was also given out to each interviewer, which define the terms which are used. (Appendices 3.3.4, 3.3.5, 3.3.6). The briefing also included trial interviews with each interviewer asking some of the questions, everyone recording the answers, and a discussion afterwards of the difficulties which occurred.

The questionnaires used to obtain data about the sample's driving were very similar to the postal and group administered questionnaires in respect of the type of information. However, they were re-designed in respect of the wording for ease of speaking rather than reading, and in respect of the layout to allow more space for the interviewer to write in the answer. The driving

history interview schedule was duplicated onto A4 size paper and was single sided for ease of handling. The forms to be filled in when the respondent had had a traffic offence or an accident were the same as the postal questionnaires. The questions were read out and the precodes were used as running prompts. The respondents were asked to draw a diagram of how the accident took place.

The interviewer made a note on a special sheet attached to the questionnaire whether other people were present in the room, or if the television was on or if the respondent was unco-operative or any difficulties occurred.

Occasionally the interviewers asked an attitude questionnaire. A third kind of information obtained from the interview was a test of the respondent's driving knowledge. A short test booklet was compiled asking questions about the Highway Code and driving procedures. The answers to the test were of the Yes/No or True/False variety. The interviewer gave no help with the test other than giving brief instructions. There was no time limit set for answering the test, although a note of the time taken was made. In compiling the test, it was felt that if it took more than ten minutes, there would be refusals or carelessly completed tests. The type of answers also speeded up the test and allowed more questions to be asked. The use of interviewers to supervise the testing of the respondents ensured certain minimum standards of conditions which could not have been obtained in any other way, e.g. the lack of collaboration with other people on the answers, a reasonable degree of quiet in the room, etc.

The interviews and mailing of the postal questionnaires were fixed for a time of year when it was easy to contact the sample - when at some time during the period allocated for the interviews, virtually the whole group would be at home for some time, e.g. Easter and Christmas - although it would be reasonable to expect most people to be home, would be a difficult time from the interviewers' point of view because of their own commitments and the long hours of darkness. The postal questionnaires were also fixed for a time when most people would be at home, e.g. September before going back to University. This was important because interviewers contacted the non-respondents. The interviews and postal questionnaires for each group were then arranged alternately and at 6 - 9 month intervals. Experience with the first group showed that more frequent contact was an unnecessary expense and might cause annoyance. It was also necessary to see that the follow up of each group, particularly for interviews, did not overlap since there were not the facilities to cope with such a large number.

The follow up schedule (Figure 3.3.1) was arranged and revised to suit external circumstances, e.g. postal strikes. Every effort was made to complete a follow up study within one month, so that their driving would relate to a similar period, e.g. hours of darkness, holiday driving, but where necessary this was extended since it was more important to contact everyone.

Since one third of the sample was recruited in any one of the three academic years 1968-71, it follows that at any one time each group had been followed up for a different length of time. Because of the large numbers involved, it was decided for administrative reasons, to follow up only one group at any one time. The first group acted as the pilot group on whom new techniques were tried.

Although the factual information required from each group for each follow up study was the same, the questionnaires did vary slightly to take into account the different circumstances of the groups and a few questions were added or deleted or asked in a different way as the follow up studies progressed. The purpose of the follow up studies was to have a continuous

record over time of each person's driving rather than at any one point in time.

3.4 Sample attrition and other sources of bias within the data

Such methods of collecting information necessarily raise questions about the effects of such re-active devices on their responses. Webb et al (1972) discuss these and alternative methods. However for such a large sample as this, data have to be collected from the subjects themselves and have to be collected in terms of verbal responses. While every effort was made to minimise all possible sources of bias, questions relating to the extent and nature of systematic errors cannot be ignored. Many of the questions are very difficult to answer accurately and there are no external sources of verification.

It is difficult to know whether the quality of the response varied between the groups. For example, did the experimental students feel that they were "letting the side down" if they had had an accident and therefore did not report it. No definitive answer can be given to this question but it should be stated that the sample were very co-operative and volunteered information about their driving and accidents. This is all the more surprising where the students admitted to being involved in very trivial accidents since they knew that if they admitted having had an accident that they had to answer a long questionnaire. While impressions must not replace scientific evidence as to the existence of a bias in response, the very co-operative support and often voluntary information even beyond the scope of the enquiry was very marked and encouraging.

It might be expected that different interviewers would have a different response rate and introduce another type of variation into the quality of the data. The early supervision and control of the interviewers soon eliminated the poor interviewers. No evidence emerged which suggested that one interviewer was getting more refusals than any other. It was impossible to check and compare the individual variation in answers from the informants questioned by each of the interviewers as each interviewer covered a small area in order to minimise costs. A thorough comparison of interviewers would involve random assignment of the members of the sample to the interviewers. Not only would this have been very costly but also it would have required a much larger team of interviewers since by covering only a small area, they spent less time travelling and were therefore able to interview fifty to sixty people in a five week period. Such a large number would have been impossible if each interviewer had to cover the whole of the North Manchester area. A larger team of interviewers would only increase the possible sources of variation.

The possibility also suggests itself that the three different methods of collecting the data introduced a bias in the type of response. As most of the questions were factual, this is unlikely to be a major problem. Occasionally because of postal delays and administrative inefficiency, some people were interviewed who had in fact returned a postal questionnaire. Little variation was found to exist. As each contact with the sample was entered onto the master sheets, it was possible to compare the information obtained with that obtained previously. The impression was gained that the information was consistent. Certainly no instances were discovered of falsification by interviewers. The design of the follow up studies lends itself to a study of the different methods of data collection and their relative effectiveness. The effect of memory, interviewer approach and many other variables could also be examined. However such a study is a research project in itself and beyond the scope of this experiment at this stage. Some of these topics will be discussed later on in this report. However, a very detailed examination was not warranted after an initial inspection of the data.

Although these problems are very real ones, it was thought that the nature of the questions being asked - being mainly factual - and the fact that the sample were intelligent and fairly articulate people and knew that they were taking part in an important project which they could see had some relevance to their lives, minimised the number and type of problems frequently encountered in social surveys. Although some inaccuracies and the forgetting of details with the passage of time seem likely, it seems unlikely that there would be much deliberate falsification of replies by the sample, nor did it seem likely that there would be many who would be reluctant to discuss their driving at all.

The data acquired from each survey was not analysed at that point but coded and entered into a master sheet for each individual so that a complete record of each person's driving at each contact was obtained. This information was then punched onto cards and machine verified and checked for data incompatibilities. Where these were found, the original source material was checked. Programs were then written to convert the data to a more usable form so that one new card was outputted with all the information relating to the subject on it for each contact. If the original surveys had been used as the primary source of analysis, only the information actually obtained during that particular survey would be available. It will be seen from Appendices 3.3.1 - 3.3.3 questionnaires were designed in such a way that only information relating to their driving since the last contact was required. This was to avoid bias due to lapse of memory and to ensure their co-operation by not asking for information which they had already given.

This discussion has centred on the problem of data collection. Another possibility presents itself - namely that the criteria or effects of driver training may be so unstable and unreliable as to be useless measurements of the effectiveness of such a course. This study was carried out to establish whether these methods of data collection are in fact capable of yielding reliable measures and producing consistent results.

Although as many checks as possible were made to ensure reliable and accurate information, it is self-evident that there is no way of verifying the information given by the students since no external source of information is available. The following analysis therefore is subject to all the errors inherent in self-report data. While these errors are not thought to be very great, there is no way of quantifying them.

The response rate was very high indeed. In general, the sample were found to be most co-operative and interested in the outcome of the experiment. A few people were, at the beginning of an interview, reluctant to answer any questions. Usually they were not drivers and therefore felt that they had nothing to contribute to the study. Several of the first and second samples were beginning to ask when the follow up studies would end and said that they were bored with the project. They nevertheless co-operated fully.

Table 3.4.1 shows the number of people in each group in the sample and the number of drivers within each group.

Table 3.4.2 shows the number of people in each year whom it was impossible to contact. It will be seen that the sample attrition was greatest in the first sample. This table also shows the reasons for non-contact. It can be seen that approximately one half of those who were not contacted could not be contacted because they had emigrated, were living a long way from Manchester, had moved to an unknown address or had died. Thus, refusals on the part of subjects account for only half of the sample attrition.

Table 3.4.3 shows the sample attrition according to group. It can be

seen that in both the boys' and girls' samples, the control group were less likely to be contacted than any of the experimental groups. Chi square tests of the significance of the difference showed that this size of difference could be expected in more than 95% of such cases in the boys' groups but in less than 1% in the girls' groups. It had been expected that the students in the control groups might be more difficult to contact and more unwilling to co-operate. This expectation has been borne out in the girls' case rather than in the boys' case. This slightly higher sample attrition rate in the girls' sample tends to reflect the fact that the girls were usually less interested in driving and the research project than the boys were.

In general, the attrition rate has doubled since the analysis carried out by Raymond et al in 1972 (1973) showing that the longer the period of the follow up studies, the greater was the likelihood of not contacting subjects. It should perhaps be pointed out that the relatively high rate of 6% for the 1970-71 sample would have been reduced had the period of time allowed the interviewers (in this instance, three months) been extended for a few more weeks to enable those people who were living away from home to be contacted. However it was felt that the extra time needed would delay the time left for the analysis of the data.

Since there was a slight bias in the response rate of the girls' sample, the characteristics of the non-respondents were examined. Table 3.4.4 shows the number of drivers and non-drivers (as known at the last time contacted) in each of the boys' groups. It can be seen that 55% of the non-respondents were not known to be drivers. As in fact, 61% of the boys had by now passed the test, this figure is rather more than could be expected by chance. It should however be recalled that this was their status at the last time we contacted them and that this may by now have changed. Table 3.4.5 shows the number of drivers and non-drivers in each of the girls' groups. 80% of the non-respondents were not known to be drivers compared with 60% of the sample who by now had still not passed the driving test.

It is possible that there are more non-drivers among the non-respondents than might be expected because they refused or were otherwise unavailable because they were not driving and therefore felt they were of little use to the research project. If, on the other hand, these differences are due to historical reasons, i.e. the information is out of date, and proportion of drivers in the samples as a whole are used to calculate the expected number of drivers, 31 drivers in the boys' sample and 17 in the girls' are expected, i.e. higher than that known to be the case. As a result of this attrition, it would appear that the number of drivers in the samples as a whole is underrepresented by 31 in the boys' case and 17 in the girls'. (5% and 8% respectively of the drivers). However as some at least of the attrition is due to deaths and emigration, this underrepresentation cannot be as great as these figures would suggest.

When the groups are compared on the basis of whether they were known to be drivers at the last time they were contacted, the differences were not found to be significant. Thus, the likelihood of the non-respondents being a driver or non-driver does not appear to have been affected by his/her membership of a particular group.

This analysis referred to above relates to the number of non-respondents at the final contact. The subsequent analysis of the data as it relates to the nature of these young people's exposure to risk consequently only refers to those drivers who responded to the final interview or questionnaire in 1974. No amendments have been made to the data by including the information yielded on a previous contact. However, in this study, since we are chiefly concerned with accidents and information about their involvement was collected at each

TABLE 3.4.1 : TOTAL NUMBER OF PEOPLE RECRUITED INTO EACH GROUP

		Pre-driver	Control	Full	Simulator	Total
Boys	numbers in group	169	401	342	25	937
	number of drivers	95 (56%)	245 (61%)	215 (63%)	14 (56%)	569 (61%)
Girls	number in group	80	478	311	33	902
	number of drivers	24 (30%)	173 (36%)	137 (44%)	15 (45%)	349 (39%)
Total	number in group	249	879	653	58	1839
	number of drivers	119 (48%)	418 (48%)	352 (54%)	29 (50%)	918 (50%)

TABLE 3.4.2 : NON-CONTACTS AT LAST SURVEY PRIOR TO OCTOBER 1974

Reasons for non-contact at last survey	1968-69 sample	1969-70 sample	1970-71 sample	Total
living abroad	9	1	8	18
living more than 80 miles from Manchester	7	1	3	11
lost trace	5	4	4	13
deaths	4	2	0	6
refusals	14	9	14	37
other	2	5	6	13
Total	41	23	35	99
% sample attrition by October 1974	7%	4%	6%	5%

TABLE 3.4.3 : SAMPLE ATTRITION WITHIN GROUPS

	Pre	Con	Full	Sim	Total	x^2
Sample attrition in boys' groups	13	31	8	2	54	
% Sample attrition in boys' groups	7%	8%	2%	8%	6%	$p<0.05$
Sample attrition in girls' groups	3	32	9	1	45	
% Sample attrition in girls' groups	4%	7%	3%	3%	5%	$p<0.05$
Total sample attrition	16	63	17	3	99	
% sample attrition	6%	11%	3%	5%	5%	$p<0.05$

TABLE 3.4.4 : CHARACTERISTICS OF THE MALE NON-RESPONDENTS

	Pre	Control	Full	Total
Drivers (at last contact)	7	10	6	23 (45%)
Non-drivers (at last contact)	6	17	6	29 (55%)
Total	13	27	12	52 (100%)

TABLE 3.4.5 : CHARACTERISTICS OF THE FEMALE NON-RESPONDENTS

	Pre	Control	Full	Total
Drivers (at last contact)	1	6	1	8 (20%)
Non-drivers (at last contact)	3	24	9	36 (80%)
Total	4	30	10	44 (100%)

contact, it does not necessarily follow that the loss in accident data, due to sample attrition, is as high as noted earlier. In many cases, it was the first time that the non-respondent had not been contacted, thus his accident history should be complete until seven months before the end of the project.

The problem of sample mortality is inherent in this kind of experiment which is carried out over a long period of time. The sample attrition, as it affects this aspect of the analysis was found to be 5% of the male drivers and 8% of the female drivers and was found to be broadly similar within each of these two samples. While it cannot be assumed that these non-respondents interact with their cars in a similar way to the rest of the sample, it is of course impossible, without examining the information they provided on previous occasions and comparing it with the information yielded by the sample on similar such occasions to state whether or not this was the case. Since the attrition was so small and did not vary within the sample, this lengthy procedure was not adopted.

3.5 Resume of the salient features of the research paradigm

This report will primarily explore and assess the effect of driver education courses introduced into the school curriculum whereby students were taught to drive and in addition received classroom tuition on various aspects of driving on accident frequencies. The research method chosen enables other factors frequently cited as influences such as personality, attitudes to safety and risk taking to be studied. Indeed without an investigation of rival hypotheses to account for any observed differences, it is difficult to arrive at any conclusions about the nature of the relationship between training and safety. The aim was to collect information on a large number of items, all of them thought to have some relevance to the effectiveness of training and road accidents, and to see, in the event, which would prove to be the clearest determinants of accidents.

Modern researchers favour the use of a rigorous system of inquiry in which hypotheses are set out from the beginning and the whole effort is concentrated upon answering questions formulated in advance, no other questions being admissable. Any one of an infinite number of possible effects of chance might otherwise be falsely interpreted after the event as evidence for some causal relationship that nobody had thought of before.

However in research such as this built around the availability of a sample that has cost a great deal of money and effort to assemble, it is desirable to collect information on as many points as possible while the opportunity presents itself. By collecting data on many different points, one has the opportunity to observe patterns of relationships between groups of variables that would not otherwise be known or predictable. This is especially important in accident research where clusters of factors, rather than any one acting in isolation, appear to be the true determinants of road accidents. It has the advantage of enabling one to allow for intervening variables in the interpretation of statistical associations. Thus one can ask questions to which without a wide range of information, one could not otherwise begin to formulate an answer.

The principle of formulating hypotheses in advance has been adhered to for the main objective of this study. The selection of secondary points of enquiry, such as the role of personality, attitudes, were naturally determined by current evidence as the influential factors most relevant to the study of road accidents. Detailed predictions as to the relative importance of these factors were not made.

The long term prospective study of a normal population (in this case, following a group of students over a period of five years) has a number of theoretical advantages over the more usual kinds of research, but it involves some serious practical problems, one of which is the length of time taken to complete it.

Many have tried to show that a course of driver training does reduce the likelihood of an individual who has received such a course having an accident on the road or committing a traffic offence. However most of the evidence on which the theories of driver behaviour rest falls far short of the ideal. Usually deductions are made from retrospective studies in which the histories of trained drivers are compared with those of untrained drivers or the histories of accident repeaters are compared with those of a control group of individuals of similar age, but free of accidents. Such studies have a number of intrinsic weaknesses. In the first place, it is difficult to know to what extent the attitudes of accident repeaters may be the consequence of being involved in an accident rather than the cause. Secondly an accident record may be the only one indicator (and an unreliable one according to other research) of unsafe driving and it may therefore be a matter of chance as to whether an individual is caught committing a traffic offence or involved in an accident.

The present project was undertaken because it was thought that a particularly good way to secure valid evidence about the effectiveness of driver education and the role of social and psychological factors would be by means of a long term study in which a sample of adolescents could be examined while young and their subsequent performance on the road followed through in some detail.

The usual choice of research method of comparing groups of people who had completed a course of driver education with one which had not, on the basis of traffic offences and accidents alone, obscures the effects of the interaction between potentially influential factors. By taking an unselected group of young people and studying a whole range of factors, one has the chance to assess more realistically the relative importance of those factors. Previous research has been of an ex-post facto nature which means that there may well be differences between those who chose to take a course in driver education and those who do not, in those very factors which are related to accidents.

This study is probably the first in the field of accident research to combine the following features: driver training as the focus of interest, the use of a group of unselected young people, observations including interviews repeated over several years and a prospective experimental design.

UNIVERSITY OF SALFORD

DRIVING HISTORY QUESTIONNAIRE

THIS INFORMATION WILL BE KEPT STRICTLY CONFIDENTIAL

INSTRUCTIONS: PLEASE WRITE YOUR ANSWER IN THE SPACE PROVIDED, OR WHERE APPROPRIATE, CIRCLE THE ITEM NUMBER WHICH APPLIES

NAME _____ MR/MRS/MISS

ADDRESS _____ TEL NO _____

_____

What is your normal full-time occupation? _____

Since last February have you held any temporary or part-time jobs in addition to this? YES 1 NO 1

Do you have a full driving licence for a car? YES 1 NO 2

(IF ANSWERED 'YES', ANSWER SECTION 2 NEXT, IF 'NO', ANSWER SECTION 1)

SECTION 1 LEARNING TO DRIVE A CAR

1. Since we last contacted you in February, have you taken any driving lessons or have you gone out driving with your father or a friend? _____
(IF ANSWERED "NO", PLEASE ANSWER SECTION 4 NEXT)

2. When did you first take out a provisional driving licence? _____

3. Who has been teaching you to drive? A professional instructor 1
or A friend or relative 2
If you are being taught by a professional instructor, do you practice driving with a friend or relative? _____

4. How many hours of driving have you done altogether - that is including practice as well as tuition? _____

5. Have you taken the driving test? YES 1 NO 2
If so: How many times have you taken it? _____
When did you take it? Please give exact date(s) _____
Where was the test centre(s)? _____

6. Are you still taking driving lessons - or practicing? _____
If not; was there any particular reason why you stopped?
_____
When did you stop driving? _____

PLEASE ANSWER SECTION 4 NEXT, OMITTING THE NEXT TWO SECTIONS

SECTION 2: THE DRIVING TEST

1. When did you take the Ministry of Transport Car Driving Test? Please give the exact date(s) _____

IF YOU PASSED THE TEST BEFORE WE LAST CONTACTED YOU, PLEASE ANSWER SECTION 3 NEXT

2. How many times did you take the test? _____

3. Where was the test centre(s)? _____

4. When did you take out your first provisional licence to drive a car?
_____

5. Who taught you to drive? A professional instructor 1
A friend or relative 2
If you were taught by a professional instructor, did you practice driving with a friend or relative? _____

6. Approximately how many hours of tuition and practice did you have altogether before you passed the test? _____

SECTION 3: DRIVING

1. Approximately how many miles have you driven since you passed the test? _____

2. Approximately how many miles have you driven in the last seven days? _____
Is this about your average weekly mileage? _____
If Not: What mileage do you usually do? _____
If you do not usually drive at all: Is there any reason why you don't drive?
_____
When did you last drive? _____

IF YOU HAVE NOT DRIVEN IN THE LAST SEVEN DAYS PLEASE ANSWER QUESTION 6 NEXT

IF YOU DO NOT USUALLY DRIVE AT ALL, PLEASE ANSWER QUESTION 11 NEXT

3. In the last seven days, what proportion of your total mileage did you drive at night? (After lighting up time)
More than half 1
About half 2
Less than half 3
None at all 4

4. In the last seven days, what proportion of your total mileage did you drive on motorways?
More than half 1
About half 2
Less than half 3
None at all 4

5. In the last seven days, did you drive most of your mileage for:
Pleasure/personal use 1
To or from work/study 2
Work 3

6. Is the car you usually drive fitted with seat belts? _____
If answered "Yes": As a driver, do you wear the seat belts:
Always 1
Most of your journeys 2
About half of your journeys 3
Less than half of your journeys? 4
Never 5

7. Do you drive most of your mileage with passengers of your own age? 1
with members of your own family? 2
with others 3
without passengers 4

8. How long are most of the journeys you drive?

Less than 5 miles	1	More than 15 and less than 20	4
More than 5 and less than 10	2	More than 20 miles	5
More than 10 and less than 15	3		

9. What kind of vehicle do you normally drive?
Make and model _____ Engine size _____ Age of car _____

0. Who owns the vehicle you normally drive?

You	1	A friend	4
Your family	2	Other	5
Your employer	3	(please specify)	

1. Since we last contacted you, have you been involved in a road accident as a driver _____

If so, did it result in injury to you?	(Accident No 1) 1	(Accident No 2)	1
did it result in injury to someone else?	2		2
did it result in damage only?	3		3

PLEASE FILL IN ONE PINK FORM FOR EACH ACCIDENT YOU WERE INVOLVED IN AS A DRIVER

2. Have you had to pay a parking fine since we last contacted you? _____
Number of times _____

3. Since we were last in touch with you, have you been charged with a traffic offence? _____ Number of times _____
PLEASE FILL IN ONE YELLOW FORM FOR EACH TRAFFIC OFFENCE WITH WHICH YOU WERE CHARGED

SECTION 4: THIS SECTION ONLY APPLIES TO MOTOR CYCLISTS

1. Since we last contacted you, have you regularly ridden a motor cycle 1
a motor scooter 2
neither 3

IF YOU HAVE NOT RIDDEN REGULARLY, PLEASE SEE THE END OF THIS QUESTIONNAIRE

2. Do you own this machine? _____

3. What is its engine size? _____ What is its age? _____

4. When did you first take out a provisional licence to ride a motor cycle? _____

5. Since then, approximately how many miles have you ridden? _____

6. Do you ride nowadays? Yes 1 No 2
IF ANSWERED "NO": Was there any particular reason why you stopped?
_____
When did you last ride? _____
PLEASE ANSWER QUESTION 10 NEXT

7. Approximately how many miles have you ridden in the last seven days? _____ 61_____
Is this about the same as usual? _____
If not, what is your normal weekly mileage? _____ 62_____
IF YOU HAVE NOT RIDDEN IN THE LAST SEVEN DAYS, PLEASE ANSWER QUESTION 10 NEXT

8. In the last seven days, what proportion of your total mileage did you ride at night? (After lighting up time)

More than half	1	63_____
About half	2	
Less than half	3	
None at all	4	

9. In the last seven days, what proportion of your total mileage did you ride on motorways?

More than half	1	64_____
About half	2	
Less than half	3	
None at all	4	

10. How often do you wear a crash helmet when you ride?

Always	1	65_____
Sometimes	2	
Never	3	

11. How did you learn to ride a motor cycle? _____ 66_____
Did you receive any formal instruction eg RAC course? _____

12. Have you taken the driving test for motor cycles? _____
IF YOU HAVE ANSWERED "NO" TO THIS QUESTION, PLEASE ANSWER QUESTION 13 NEXT
Did you pass the test? _____ 67_____
How many times did you take the test? _____ 68_____
When did you take the test? Please give the exact date(s) _____ 69_____
Where was the test course(s)? _____

13. Since we last contacted you have you been involved in a motor cycling accident? _____
Number of times _____ 71_____

If so, did it cause injury to you?	Accident (No 1) 1	(No 2) 1	(No 3) 1		
did it cause injury to someone else?	2	2	2		72_____
did it cause damage only?	3	3	3		

PLEASE FILL IN ONE PINK FORM FOR EACH ACCIDENT YOU WERE INVOLVED IN AS A RIDER.

14. Since we last contacted you, have you been charged with a traffic offence? _____ 73_____
Number of time _____
PLEASE FILL IN ONE YELLOW FORM FOR EACH TRAFFIC OFFENCE WITH WHICH YOU, AS THE RIDER OF A MOTOR CYCLE, WERE CHARGED.

PLEASE REMEMBER TO FILL IN THE PINK AND/OR YELLOW FORMS WHERE APPROPRIATE.
THANK YOU VERY MUCH INDEED FOR YOUR HELP.

Signature _____ Date _____

1 39 1

UNIVERSITY OF SALFORD
ACCIDENT DESCRIPTION FORM

It is important for this research to have details about each of the accidents in which you as a driver were involved. Please fill in one of these forms for each accident you mentioned in the Driving History Questionnaire.

THIS INFORMATION WILL BE KEPT STRICTLY CONFIDENTIAL

INSTRUCTIONS: UNLESS OTHERWISE STATED PLEASE CIRCLE THE ITEM NUMBER WHICH APPLIES

FOR OFFICE USE ONLY

1 62 ____
3 ____
7 ____
9 ____
10 ____
11 ____ __
12 ____
13 ____
14 ____

1. What kind of vehicle were you driving? Car 1; Van 2; Motor cycle/scooter 3

2. Was this the vehicle you usually drove at that time? (Yes/No) _____
   What was the make? _____ What was the engine size? _____
   What was the model? _____ What was the age? _____

3. What was the purpose of the trip you were making when the accident occurred? Social call/personal use 1; Work 2; To or from work/place of study 3; Driving instruction 4; Other _____

15 ____
16 ____
17 ____
18 ____
19 ____

4. How many vehicles, including your own, were involved in this accident? _____
   What were the other vehicles involved? eg car, van, sportscar, motor-cycle etc _____

20 ____

5. When did this accident happen? Please give the exact date _____

21 ____

6. Where did this accident take place? Please name the street and town.
   Street _____ Town _____

7. At what time of day did this accident occur? _____ am/ _____ pm

23 ____

8. Did it occur within fifteen miles of your home? (Yes/No) _____

25 ____

9. What speed were you doing when the incident started to develop? _____

26 ____

10. On what kind of road did this accident take place?
    Motorway 1; Clearway 2; Dual-carriageway 3; Four lane road 4; Three lane road 5; Two lane road 6; One way street 7; No lane marking 8; Don't know 9; Other (Please specify) _____

28 ____
29 ____

11. What was the speed limit on that road?
    30 mph 1; 40 mph 2; 50 mph 3; 60 mph 4; 70 mph 5; Don't know 6; Other (please specify) _____

12. What were the light conditions at the time?
    Dawn 1; Daylight 2; Dusk 3; Dark(Streets unlit) 4; Dark(Streets lit) 5

30 ____

13. What were the weather conditions at the time?(Put circles round all that apply)
    Clear 1; Rain 2; Snow 3; Fog 4; Severe winds 5

31 ____

14. What were the road conditions at the place of the accident? (Put circles round all that apply).
    Dry 1; Greasy 2; Wet 3; Muddy 4; Icy 5

15. What was the condition of the road surface at the place of the accident?
    Smooth 1; Potholed 2; Loose chippings 3; Cobbled 4

16. Did the accident take place at or near:

A roundabout?	1	A 'T' junction?	6
A 'Y' junction?	2	Crossroads?	7
A junction with more than 4 roads?	3	Another type of junction?	8
In a private drive/entrance/car park	4	Not at or within 20yds of junction	9
A staggered junction?	5	A pedestrian crossing?	10

17. What were all the vehicles which were involved, (including your own) doing just before the accident happened?

	Your Vehicle	Other Vehicle(1)	(Other 2)	(Other 3)
Making normal progress	1	1	1	1
Waiting to go ahead, but held up	2	2	2	2
Overtaking a moving or held up vehicle	3	3	3	3
Turning or waiting to turn left	4	4	4	4
Turning or waiting to turn right	5	5	5	5
Slowing down or stopping eg at lights	6	6	6	6
Moving off	7	7	7	7
Parked	8	8	8	8
Parking	9	9	9	9
Reversing	10	10	10	10
Turning round	11	11	11	11

1 40 1

18. Was a pedestrian involved in the accident? (Yes/No) _____
    If so, was he/she crossing the road at a pedestrian crossing? 1
    crossing the road within 20yds of a pedestrian crossing 2
    crossing elsewhere? 3
    on the pavement? 4
    on the central strip? 5
    boarding or alighting a bus? 6
    on the road not crossing? 7

19. Did any of the vehicles involved in the accident skid?
    No 0; Your vehicle 1; Any other vehicle 2

20. Were you wearing a seat belt at the time of the accident?
    Yes 1; No 2; Not fitted 3; Doesn't apply (motor cycle) 4

21. Was your passenger (if any) wearing a seat belt?
    Yes 1; No 2; Not fitted 3; No passenger 4; Doesn't apply(motor cycle) 5

22. Had anyone involved in the accident been drinking? (Please circle all that apply)
    Yourself 1; Other driver (No 1) 2; Other driver (No 2) 3; Pedestrian 4; Your passengers 5; No 0

23. In your opinion did the presence of any of the following contribute to the accident? (Put circles round all that apply) 44

Parked vehicles	1	Dog on road	4
Level crossing	2	Object on road	5
Lamp post, road furniture etc	3	None	6

Other (please describe) _____

24. Immediately before the accident happened, (Please circle all that apply) 45

Were you tired?	1
Were you not feeling well?	2
Were you tense or emotionally upset?	3
Had you been drinking	4
Had you taken medicines, eg aspirin, in the previous 6 hours?	5
Were you feeling the same as usual?	6

25. Was a lapse of attention on your part a factor in the accident? (Yes/No) _____ 46

If so, what distracted you?

The conversations or actions of a passenger	1
Looking for something in the car, eg in the glove compartment	2
Preoccupation with a problem	3
Preoccupation with something outside the car	4
The radio	5
Other (please describe) _____	6
Not applicable	7

26. What parts of the vehicles involved in this accident were hit?

Put circles round all that apply

	(Your vehicle)	(Other No 1)	(Other No 2)	
Front	1	1	1	47
Back	2	2	2	48
Near side	3	3	3	49
Off side	4	4	4	

27. What was the cost of repairing:

	(Your vehicle)	(Other No 1)	(Other No 2)	
£0	0	0	0	
£1-25	1	1	1	50
£26-50	2	2	2	51
£51 and over, vehicle driven away	3	3	3	52
£51 and over, vehicle not driveable	4	4	4	
Write off	5	5	5	
Don't know	6	6	6	

28. Who bore the cost of repairing:

	(Your vehicle)	(Other No 1)	(Other No 2)	
You	1	1	1	53
Your insurance company	2	2	2	54
The other person	3	3	3	55
His insurance company	4	4	4	
Don't know	5	5	5	
Cost divided (give details below)	6	6	6	

29. Did the accident result in any injuries? Please specify below.

NB An accident injury is here defined as:

Slight: if person detained for less than 24 hours in hospital and/or stayed off work for 3 days or less

Serious: if person stayed off work as a result of the accident for more than 3 days but less than a fortnight

Very serious: if stayed off work for longer than a fortnight

No injury: if person did not go to hospital or take any time off work

	Yourself	Other	Other	Other
No injury	1	1	1	1
Slight injury	2	2	2	2
Serious injury	3	3	3	3
Very serious injury	4	4	4	4
Fatal		5	5	5
Not known		6	6	6

30. Were the police present when the accident occurred? (Yes/No) _____

Was this accident reported to the police? (Yes/No) _____

If so, who reported it? You 1

Third party involved in the accident 2

Witness 3

Not known 4

31. Did you give details of this accident to your insurance company? _____

32. Did this accident result in you being charged with a traffic offence? _____

IF YOU HAVE ANSWERED "YES" TO THIS QUESTION, PLEASE FILL IN A YELLOW FORM

33. Did this accident result in another driver being charged with traffic offence?

Yes 1 No 2 Don't know 3 Not applicable 4

34. We should like you to assign the percentage of the blame to the various people involved in the accident.

Yourself_____ Other(1)_____ Other(2)_____ Chance_____

35. Please describe and draw a simple sketch showing how the accident happened, giving details of the position and direction of the vehicles, the approximate speeds as the accident started to develop, and all other relevant details such as junctions, crossing, traffic lights, parked vehicles, pedestrians etc. Please identify your vehicle as No 1.

Signature_____ Date_____

UNIVERSITY OF SALFORD

TRAFFIC OFFENCE FORM

It is important for this research to have details about each traffic offence with which you have been charged. Please fill in one of these forms for each INCIDENT which resulted in you being charged with a traffic offence(s).

THIS INFORMATION WILL BE KEPT STRICTLY CONFIDENTIAL

INSTRUCTIONS: UNLESS OTHERWISE STATED, PLEASE CIRCLE THE ITEM NUMBER WHICH APPLIES

FOR OFFICE USE ONLY 1 63

SECTION 1

1. What was the offence(s) with which you were charged? 3
   1. _____
   2. _____ 7
   3. _____ 9

2. What kind of vehicle were you driving? 10
   Car 1
   Van 2
   Motor cycle/scooter 3
   Not driving 4
   Other (please give details) 5
   _____

3. Was this the vehicle you usually drove? (Yes/No) _____ 11
   the make and model _____ 12
   the Engine size _____ 14
   the age _____ 16

4. What was the purpose of the trip you were making when the incident occurred? 18
   making a social call/personal use 1
   to or from work/place of study 2
   work 3
   Other (please specify) 4
   _____

5. How many other vehicles, excluding your own, were involved in the incident? 19
   _____

6. Please give details of the other vehicles (if any) involved in the incident. 20
   ie. whether car, van, sports car, cycle, etc _____ 21

7. Were the police present when this incident occurred? (Yes/No) _____ 22

8. a) If you answered 'Yes' to question 7:
   Was the policeman on the beat? 23
   in a panda car? 2
   in a patrol car? 3
   directing traffic? 4
   operating a radar trap? 5
   other (please give details) _____

1

8. b) If you answered 'No' to question 7:
   Who reported the incident to the police?
   You? 1 A third party involved in the incident 2
   Witness? 3 Other (please give details) _____
   Don't know 5

9. Were you charged with this offence as a result of being involved in an accident? (Yes/No) _____
   If so, please make sure that you have filled in a PINK form for this accident and omit section 2.

APPENDIX 3.3.3

SECTION 2 DESCRIPTION OF THE INCIDENT

1. When did this incident happen? Please give the exact date _____

2. Where did this incident take place? Please give the name of the street and town
   Street _____ Town _____

3. At what time of day did this incident occur? _____ am/ _____ pm

4. Did it occur within fifteen miles of your home? (Yes/No) _____

5. What speed were you doing when the incident started to develop? _____

6. On what class of road did this incident take place? 1
   Motorway 1 Clearway 2 Dual-carriage way 3 Four lane road 4 42
   Three lane road 5 Two lane road 6 One way street 7 No lane marking 8
   Don't know 9 Other (please specify) _____

7. What was the speed limit on that road? 30 mph 1 40 mph 2 50 mph 3
   60 mph 4 70 mph 5 Other (please specify) _____ Don't know 7

8. What were the light conditions at the time?
   Dawn 1 Daylight 2 Dusk 3 Dark (street unlit) 4 Dark (street lit) 5

9. What were the weather conditions at the time? (Put circle round all that apply)
   Clear 1 Rain 2 Snow 3 Fog 4 Severe winds 5

10. What were the road conditions at the time? (Put circles round all that apply)
    Dry 1 Greasy 2 Wet 3 Muddy 4 Icy 5

11. What was the condition of the road surface at the place of the incident?
    Smooth 1 Potholed 2 Loose chippings 3 Cobbled 4

12. Did the incident take place at or near:
    A roundabout? 1 A 'T' junction? 6
    A 'Y' junction? 2 Crossroads? 7
    A junction with more than 4 roads? 3 Another type of junction 8
    In a private drive/entrance/car park 4 Not at or within 20yds of junction? 9
    A staggered junction? 5 A pedestrian crossing 10

2

13. What were all the vehicles which were involved, (including your own) doing just before the incident happened?

	Your Vehicle	Other Vehicle(1)	(Other 2)	(Other 3)
Making normal progress	1	1	1	1
Waiting to go ahead, but held up	2	2	2	2
Overtaking a moving or held up vehicle	3	3	3	3
Turning or waiting to turn left	4	4	4	4
Turning or waiting to turn right	5	5	5	5
Slowing down or stopping eg at lights	6	6	6	6
Moving off	7	7	7	7
Parked	8	8	8	8
Parking	9	9	9	9
Reversing	10	10	10	10
Turning round	11	11	11	11

14. Was a pedestrian involved in the incident? (Yes/No)_____ 43___

If so, was he/she
- crossing the road at a pedestrian crossing? 1
- crossing the road within 20yds of a pedestrian crossing 2
- crossing elsewhere? 3
- on the pavement? 4
- on the central strip? 5
- boarding or alighting a bus? 6
- on the road not crossing? 7

15. Did any of the vehicles involved in the incident skid? 44___
Your vehicle 1 Any other vehicle 2 No 0

16. Were you wearing a seat belt at the time of the incident? 45___
Yes 1 No 2 Not fitted 3 Doesn't apply (motor cycle) 4

17. Was your passenger (if any) wearing a seat belt? 47___
Yes 1 No 2 Not fitted 3 No passenger 4 Doesn't apply(motor cycle) 5

18. In your opinion did the presence of any of the following contribute to the incident? (Put circles round all that apply) 48___

Parked vehicles	1	Lamp post, road furniture etc	5
Dog on road	2	None	6
Level crossing	3	Other_____	
Object on road	4		

49___

19. Immediately before the incident happened: (Put circles round all that apply)
- Were you tired? 1
- Were you not feeling well? 2
- Were you tense or emotionally upset? 3
- Had you been drinking? 4
- Had you taken medicines eg aspirins, in the previous 6 hours 5
- Were you feeling no different than usual? 6

20. Was a lapse of attention on your part a factor in the incident?(Yes/No)_____
If so, what distracted you? (Put circles round all that apply)
- The conversation or action of a passenger 1
- Looking for something in the car, eg in the glove compartment 2
- Preoccupation with a problem, or something outside the car 3
- The radio 4
- Other (please give detail)_____
- Not applicable 6

SECTION 3 THE OUTCOME OF THE OFFENCE

1. Did the court find you guilty of the offence(s)? (Refer back to Section 1, question 1, for the order in which you listed the offences)

	Offence (No 1)	(No 2)	(No 3)
Yes	1	1	1
No	2	2	2
Case not yet heard	3	3	3

If you have answered "Yes" to question 1, what penalty did you receive? eg. fine, endorsement, licence withdrawn etc. Please give details of the amount of the fine and the length of time for which the licence was withdrawn (if applicable). 1 43 1

Offence No 1 _____
Offence No 2 _____
Offence No 3 _____

2. What was the date of the court hearing? _____

3. Where was the case held? Town _____

Thank you very much for your help.

Signature _____ Date _____

Notes for Interviewers on the Questionnaire 66
Driving history Interview Schedule - April 1970

Fourth contact for 1968-69 sample

Opening words when the interviewee has been identified

"I am calling in connection with the University of Salford's Road Safety Research Project in which you are participating. You have already been kind enough to answer some questions for our driver safety education experiment. Would it be convenient to ask you about your driving experience now?"

If you are not invited inside, please ask:

"Please may I come in as this will take a few minutes".

Try to obtain an interview without other people being present, but do not insist.

If they are busy, "If I may, I would like to call again some other day to see you when you are less busy".

If the person you want is not in: "I am calling on behalf of Salford University and I have been asked to see your son/daughter about the road safety project in which he/she is taking part. When is he/she likely to be in - so that I may call again?"

In the box headed 66, write in the student's identity number (a four figure number)

Fill in the name and address as given by the University and telephone number.

If the parents have moved, please write in the new address and phone number.

If you have been given another address at which you contacted the interviewee which is not the parents' home or the permanent home of the student eg. flat or digs - write this address in.

Write in the date and time of the call - and if contact was not made, the suggested time of recall.

Note the time the interview finished.

Comment if anything untoward happened - if uncooperative etc.

Make a note of who else was in the room when you interviewed the respondent,

and sign the interview schedule on completion.

When sitting down say "all the information you give us will be kept completely confidential and will not be divulged to anyone"

1. Occupation - if at college - note college - course studied
if out of Manchester area - note the address.

2

2. Part-time jobs since October 1970.

3. Temporary jobs since October 1970.
Answer Yes/No
ie. in addition to the regular full-time occupation. Most will still be students or trainees. The aim of this question is to find out whether he/she is earning any money - since driving is an expensive hobby. You may give this explanation if anyone asks.

4. If answered Yes - omit Section 1.
If they have passed the driving test and have a pink slip, but have not exchanged their provisional licence for a full licence, this counts as 'Yes'. They usually hesitate or say that they have a pink slip.

Unless otherwise stated, please circle the answer or item number which applies.

Probes to use are usually "well approximately then"
or "could you give me some idea, I know it's difficult"

Unless otherwise stated, these questions apply to the past 6 months driving experience - ie. since we last contacted them. For those people whom we did not contact last September, amend to read "last year" - or "February-March". There is a note to this effect on the address lists.

INSTRUCTIONS are in capitals.

P = probe

RP = running prompt.

If had to probe for an answer, write in answer against the probe.
If answer without probing - write in answer against the question.

If answers don't fit the precode or you are uncertain anyway - please write in the answer verbatim.

SECTION 1

This section refers to learning to drive a car only.

1. Lessons refers to formal instruction by a commercial motoring school and/or informal practice with father, ie. Have they been behind the wheel since last contact.
Note that people often do not regard lessons from their father as lessons but as practice, so remember to probe

2. Month obtained provisional licence - we want to know how soon after 17th birthday they started to learn to drive.

3. The second part of the question will only be asked if being taught to drive by a professional.

3

4. Total number od driving hours - lessons = formal training
practice = informal training
ie. behind the wheel.

5. ie. taken the test and failed - If answer "No" ask question 6 next.
Month - if can't remember exact date - we want to know how long after starting to drive they took the test.
Address of test centre - place where took the test.

Note date and address of <u>all</u> the tests taken in the right order.

It is possible that failed more than onece - write the same information oor the test in the left hand margin - labelling it <u>No 2 test</u>.

Answer Section 4 next.

<u>SECTION 2</u>

Refers to car drivers only. Q 1. (P) "was it long after your 17th birthday?" As questions 2-6 in previous section.

If they have already given usethe information about the test last time ie. if passed before September - write in when it was and ask Section33 next. Not many should need to be asked in this section.

<u>SECTION 3 : Driving</u> This refers to cars, vans, 3 wheelers

1. (P) "Could you give me at least some idea?"
"Well not exactly"

2. - Last seven days - (P) since last (eg. Thursday)

3rd part of question reads "What mileage do you usually do?" and will only be asked if answered "no" to second part of question.

Check that average weekly mileage ties in reasonably well with question 1. If refused to answer question 1, you could now ask the question again. If discrepancy, say "I think you said that you had done roughly ..... miles, is that right?" implying that you, the interviewer, might have made a mistake.
Find out why haven't driven. If don't drive at all ask Q 11 next.
If haven't driven in last seven days, ask Q 6 next.

Q 3, 4, 5, 6, 7, 8 Running prompts

5. If any other purpose eg. first passed test - write in driving instruction at side.

Q 6 & 8 A journey is a single journey - eg to see a friend and return is 2 trips.

9. Make - BMC etc and model - name of model is usually enough eg Mini
Engine capacity - cc
Age of car - when was it registered
It is important to have these details since the number of accidents is associated with type of car, eg old banger, sports car etc.

If drives 2 cars, write in the one he drives the most miles in first and then the other one underneath. But stress "usually" meaning "most miles".

4

10. Running Prompt. Father's employer - code father
If hire purchase or has a loan, belongs to person who incurred the debt.

11. "Accident" means anything resulting in damage to vehicle and/or injury to road user. The accident which occurred first is No 1 the second is No 2.

They have been asked this question before, so every accident they have had since the last contact.

11, 13, Note that you must probe if answer "No"

SECTION 4 This section refers to motor cycling only.

1. Regularly - at frequent intervals - rather than just trying out a friend's scooter. If relieve 'No' for answer - Probe - "not at all?" only fill in this section if he has ridden a motor cycle more than a couple of times.

2. - means the one they ride the most miles on. Do you or did you own it?

3. We want details of the motor cycle, since accidents are associated with the type of motor cycle.

4. Try to get the month they first took out a provisional licence, if they can't remember the exact date - we want to know how soon after their 16th birthday they started to ride. (P) Was it long after your 16th birthday?

5. "Approximately" - (prompt). "Could you give me some idea then?"

6. Month they stopped is sufficient or if they can't remember - find out when they allowed their provisional licence to lapse - we want to know how long they were riding for. Now = nowadays - need not necessarily have ridden in the last 7 days.

7. Prompt - "approximately".
If answered 'No' to question 7, answer Q 10 next.

8, 9, 10 Running prompts

11. Write in their answer.

12. Month of passing test, if they can't remember exactly - we want to know how long after starting to ride they took the test.
Address of test centre - where they went to take the test eg Strangeways, Manchester.

13. "Accident" is an incident involving damage to vehicle or road furniture and/or injury, therefore, an incident such as damaging the vehicle as they leave their drive, is counted as an accident. The accident which occurred first is Accident No 1 the second is No 2. Complete the rest of the questionnaire before filling in a pink form. One pink form for each accident.

5

14. Traffic offence - other than parking - complete the rest of the questionnaire and then fill in a yellow form.

Check to see if any pink or yellow forms are to be filled in. If not, terminate this part of interview with:

"Thank you very much for your help. As you know, the purpose of the experiment is to compare young people's driving record over a period of 3 years and so we will be keeping in touch with you from time to time - probably by post and it will be in about a year's time before we contact you personally again".

This may lead them to tell you about their whereabouts in the next year - whether the family are moving or emigrating. Please make a note of this on the white sheet attached to the questionnaire and on the call sheet.

This interview may take from 5 mins (including getting into the house if only answer section 2, to 15 minutes if they answer all the sections).

Please ask them to fill in the knowledge test.

Notes to interviewers - February 1972

Accident Description Form 62. (Pink)

Since this is the most important part of the follow up studies, it is important that this information is as accurate as memory permits. Try to get as many details as possible, however trivial the accident seems. Please persevere as this information is v ry important - The purpose of interviewing is to get as complete a picture as possible - often the respondents leave out questions if they have difficulty with it. If there is no answer, at least write in 'does not apply (DNA)'.

First of all stress that the information they give will be kept confidential. It will not go beyond the esearch team and will not be given to the police, their insurance company, parents or employers etc.

Secondly, since this is a long, tedious questionnaire, ask them to explain in their own words what happened. This gets them talking more freely and helps them to recall the more precise details that they require. You can be filling in the questionnaire as they are talking, if it is applicable. But do check that it is correct. On the piece of paper attached to the questionnaire, write down briefly what happened. There have been some accident forms returned to us where it has been very difficult to work out what has happened.

One form is to be filled in for each accident where accident is an incident involving damage and/or injury, therefore an incident such as damaging the vehicle as they leave their drive, is counted as an accident.

Where it says office use only: on the line marked 3, write in student identity no.

Unless otherwise stated, please circle the item numbers which apply and if the answer is different, please write in.
Unless otherwise stated, all questions refer to one accident and the vehicle he/she were driving at the time.

Section 1

1. If they were driving another type of vehicle, write in, eg. it could be possible to drive a three wheeler when the accident occurred.

2. Description of vehicle. Make - BMC Vauxhall etc.
Model - Viva, Corsair, Cortina GT, etc.
Engine size - cylinder capacity
age of vehicle - date when registered - keep a record of the year of the different registration plates with you since the number of accidents is associated with the type of vehicle, age etc.

3. Making social call, work etc. Running prompts. If other, please specify.

4. Total number of vehicles involved in accident - including own. Type of vehicles involved - other than own. ie. If car, van, motor cycle.
If more than 1 other vehicle, keep to the same order throughout.

5. Try to get at least the month and year it happened. If they cannot remember, by the time they have filled in Q 10, they should be able to remember approximately. S go back after Q 10. (If we get the exact date, we can check the police records. We also want to know how long after driving they had the accident). If they cannot give the month, at least the season or which school term.

6. As near as possible - if possible near which junction, so that we can picture where accident took place - especially if in Manchester area.

7. Try to get the hour of the day. If they can't remember, ask if am. or pm. By the time they have answered Q 12 they should be able to recall it, so go back after Q 12.

8. (P) 'Well approximately' - Purpose is to find out whether likely to be familiar with area and if on a long journey or short journey.

9. (P) 'Approximately' - If appropriate, get speed when first saw the danger, and then speed at point of collision.

10. If the accident took place on another class of road, please write in. eg. private drive or entrance, car park.
NB. 2 lane road has room for 2 cars, 3 lanes for three cars - not necessarily in same direction.

11. Speed limit - there may have been none, eg. if in own drive-way, or there may have been another speed limit than those mentioned - so please write in.

12. Running prompts code all that apply

13. " " "

14. " " "

15. " " "

16. " " "

17. " " code relevant item. NB. 9 = none of other codes - along the road.

"Making normal progress" - going ahead - following road round bend.

"Waiting to go ahead, but held up" in a queue or becuase there is an obstruction or traffic signals.

"Overtaking or moving or hold up vehicle" - or moving out to overtake use this category if in fast lane of dual carriageway, motorway.

"Turning or waiting to turn left" waiting - stopped or crawling in a line or on own, waiting for traffic and pedestrians to clear to turn left.

"Turning or waiting to turn right" waiting - stopped or crawling in a line or on own, waiting for pedestrians and traffic to clear before turning right.

"Slowing down or stopping" - pulling in, about to park - stopping at lights.

"Moving off" from parked position.

"Parked" - engine off.

"Parking" ie. manoevering - could include reversing

"Reversing" eg. round a corner - not reversing when parking - could include reversing from parked position.

'Turning round" - "U" turn
If not sure, write in or code all that apply .

18. If answered yes, ask second half of question - leaving out 'if so' 'involved' - not necessarily hit, but who caused avoiding action to be taken, thereby causing an accident. eg. if on pedestrian crossing and therefore, driver had to stop.

19. Find out which vehicle skidded - if any. Otherwise code. 'None' 'Involved' - not necessarily hit - but caused avoiding action to be taken.

20 & 21 Do not ask if motor cycling accident, but circle no. 4. (q, 20) & 5(q. 21).

22. If answer 'Yes', find out who. Ie. a driver or pedestrian (not a passenger) who was involved in the accident - not necessarily hit, but who caused avoiding action to be taken. Code all that apply.

23. Running prompts. A physical object, eg. road design etc. which caused accident - completely external to the driver involved. Not other or faulty engine. If none, code 6.

24. Ask each part of the question as a separate question - and circle if answer 'yes'. Circle all that apply.

25. Ask the first part of the question - if answer 'Yes', ask "What distracted you?" and use the precodes as running prompts. If answer "No" write in "No" and code 7.

26. Write in which parts of each vehicle were hit (not necessarily damaged) and which were damaged. With motor cycling accidents write in the damaged parts. It is important to get exact information about this. Point out that 'nearside' is passenger side and 'offside' is driver's side. If they say 'nearside' or'offside', ask them 'you mean the passenger side or driver side,' as many people are confued by these terms. It can be turned upside down - write this in.

27. Ask 'what was the cost of repairing your vehicle?'
" " " " " " the other vehicle?'

Again, this is very important and has not generally been answered very well.. Code as applicable and write in the amount at the side. I realise that they don't always know, especially when insurance are paying, or they do not bother to repair it. Ascertain what is meant by 'write off' and how much it would cost to repair it - since writing off a fifteen year old car is not necessarily as serious an accident as that of a one year old car.

Where the other vehicle is concerned, they are very unlikely to know the cost. If they guess, ask how they know, especially if it was a 'write off' Note if they know the cost as a fact or are estimating and the source of the information.

28. Ask 'Who bore the cost of repairing your car?'
" " " " " " the other car?'
Again this is important, and has not been answered well. Sometimes it is genuine because it is not yet sorted out and they do not know about the other car. If they don't know, circle S. If not done and do not intend to repair it or nothin to repair - write in '0'. under appropriate column. Give details of divided costs at side. Find out how they know who is paying for either vehicle - see if they know as a fact or are guessing and write this in. 'Own insurance Co.' or 'you' to be coded if it were paid for by firms' car ubsurance company. 'You' might mean the father.

29. Code as applicable - and note who the others are. eg. driver of other car or own passenger. Concussion = slight injury. There are problems 'staying off work', as not all are working - assume that they work - would they have been fit to go back or not.

30. Police present - eg. just happened to be there, or controlling traffic at the time.
If answer 'No' ask whether reported to police - use the precodes as running prompts and write in if do not fit precodes.

Try to make this question sound 'inoffensive - do not imply that it should have been reported to the police - it would only be necessary if someone was injured or had failed to stop.

31. Do not imply that it was necessary to report it to the insurance company - since most of the accidents are very trivial and would jeopardize their no-claims bonus. Own insurance company = insurance Co. with which car they were driving, was insured with because it could have been firm's car, or driving school's car.

32. Yes or No. If the accident happened more than 14 days previously and with the respondent has not received a summons (must be served with notice of intention to prosecute within 14 days even if in fact no action is subsequently taken).

So it is possible if the accident happened within the last 14 days that the respondent may not know. Write in DK.

If yes - remember to fill in yellow form.

Was the other driver charged? The note above applies. It is unlikely that the other would be charged without the respondent being asked to serve as witness. But he would not know, necessarily, till a few weeks before the court hearing,

Possible answers are Yes, No, DK
If possible, try to ascertain the charge, if any. Write in.

33. We want the respondent to assign the proportion of the blame to the various people involved and the part played by chance. Check to see that the total is 100%. It is important to find out the relationship between what he feels is his own responsibility for the accident and his actual responsibility as defined by the Highway Code and his insurance company.

34. Please ask the respondent to draw a diagram of the accident on the separate sheet of paper. Show how it happened - check that it fits in with previous description and that you understand what has happened. Put in direction, speed of all the vehicles and make it clear what parts of the vehicle were hit, since this is crucial for assigning responsibility. Make sure that the positions of the vehicles relative to the road are clear - put it centre lines, give way signs etc. and all other relevant details. This is very important and has not been done very well. Add a few words how the accident happened. Please add any points which were not covered in the questionnaire.

Please thank them and sign the form and date it. Attach this form and any others to this particular respondent to the driving history schedule.

Notes for Interviewers - February 1972

Traffic Offence Form. q . 63. (yellow)

It is very important that the information relating to traffic offences should be accurate. Try to get as many details as possible, however trivial the incident seems.

First of all, stress that the information they give will be kept confidential, that it will not go beyond the Research Team and will not be given to the police, insurance company, parents, employers etc.

This is a long questionnaire which has been very difficult to design because there are so many kinds of offences - moving and stationary. If it arose when the vehicle was parked and relates to a non-driving offence eg. no tax, no disc, or in a bad state of repair, or the person was not driving- but was a passenger eg. aiding and abetting driver to carry a passenger without a full motor cycling licence - this is obviously difficult. You must use your own discretion and only ask the questions which are applicable. If in order to avoid annoyance by asking irrelevant questions, you did not ask some questions, write in exactly what happened and what the circumstances which aroused the police's interest were.

Please get information relating to every single traffic offence with which they have ever been charged - as this is the first contact you will need full details for charges such as 'driving without due care', 'speeding' etc.

Fill in one yellow form for each incident which resulted in the respondent being charged with a traffic offence. It is likely that an 'incident' or 'accident' will give rise to several offences. Space has been left for 3 - if more write in at the side. Charged = received court summons or notice of intention to prosecute which must be served within 14 days of the incident. The intention to prosecute will contain a range of offences larger and possibly more serious than the ones actually served. Where it says 'OFFICE USE ONLY' on line marked 3, write in student identity number.

Section 1

1. The charges eg. speeding. There may be several charges - all very similar or very separate and distinct ones.

2. Kind of vehicle - other - write in eg. 3 wheeler. It is possible that the respondent was not himself driving eg. if charged with 'aiding and abetting' other person to i) carry passenger on motor-cycle when not holding full licence and ii) ride motor-cycle when not displaying 'L' plates. Explain if not driving - whether a passenger, or in charge of the vehicle.

3. If he was not the driver - write this in (next to Yes/No) but obtain details in any case, of the vehicle to which the offence related.

   make eg. Vauxhall
   model eg. Viva SL
   engine size, cylinder capacity eg. 1600
   age of vehicle - year of registration

5. The number of vehicles, excluding the respondent's, involved in the incident - probably none, unless charged as a result of an accident.

6. As question 2

7 & 8 were the police present? If yes - fill in section 8a
Write in other, eg. Accident Prevention Unit
If no - ie. it was reported to police, fill in section 8b.

9. If 'Yes' omit section 2.

Section 2

1. Try to get at least the month and year.

2-20 are as a cident description form - see notes.
Get the respondent to sketch the incident as accident description form.

12 Will most often by No. 9. Not at junction.

Section 3

1. Circle the precodes, check that no. 1 and no. 2 and 3 offences are the same in section 1 qu. 1. If more than 3 offences, write in the appropriate number of the right hand side of col. 3. Get details of penalty received for each offence. This can be difficult since there may be one penalty for all the offences.

Section 4

Own signature and date of interview

Attach this form to all the others relating to this respondent.

CHAPTER FOUR THE RELATIONSHIP BETWEEN DRIVER EDUCATION AND ACCIDENTS

The primary focus of interest in driver education is on its role as an accident countermeasure. Nearly all previous research on driver education in the United States has concentrated on this aspect in evaluating its effectiveness. Because there are other aspects to the concept of road safety besides accident involvement, these have been considered in previous reports. If any or all of these intermediate effects are related to accident involvement, they could then be considered as criteria by which to measure the effectiveness of driver education in safety (as opposed to educational) terms. This study is as much concerned with the usefulness of the short term and intermediate effects and their relation to road safety, as it is concerned with analysing the effects of various programmes of driver education on the accident involvement of young people.

It is self-evident that many variables, in addition to the type of training a driver receives, contribute to a driver's involvement in accidents. The number of such variables may be infinite. This study of accident involvement is restricted to only a few. The choice of variables was determined by previous research. In addition, the effect of a few other variables could be examined because of the innovationary method of the research. The effect of these variables is considered on a uni-dimensional basis in the first place and subsequently, where possible, on a multi-dimensional basis. The interaction of driver training and these other variables is also discussed.

Variables such as age, experience, mileage, accident situation and the degree of severity and responsibility are considered not only to ascertain the effect of driver education but also so that future driver education programmes should be based on an understanding of the main dangers that may befall young people. Driver education courses have been designed on the basis of intuition, rather than knowledge of the type of accident in which a young driver is more likely to be involved. It is possible that driving presents greater difficulties to young as opposed to older novice drivers and to female as opposed to male drivers. This study attempts to examine these questions and to assess their implications for the design of driver education courses.

First of all, a study is made of all the groups' involvement in road accidents and the effect of driver education on young people's subsequent behaviour on the road. These effects, such as they are, are described and the implications for training and future research are noted. In addition to the analysis of the outcomes of driving, namely accidents, an analysis will also be carried out of the antecedent behaviour, in order to see the effect of driver education on safety, in behavioural terms. A similar study is also made of their involvement in traffic offences and an attempt is made to isolate the effects of driver education. An analysis of the relationship between accidents and traffic offences is made and the usefulness of traffic offences as a criterion of driving proficiency is discussed.

4.1 The relationship between driver education and the number of accidents

In order to isolate the effect of a course of driver education on accident involvement, as many variables as possible will also be examined for their effect on accident frequencies. In the initial stages of the analysis the total number of accidents will be considered as a whole, rather than subdividing them on the basis of severity or any other classification. This will enable a broad comparison to be made with American results and of course simplifies the analysis. Subsequently they will be subdivided and considered in smaller groups. A comparison of these results will show whether it is reasonable to treat accidents as homogeneous events.

Previous American studies have been criticised because of the volunteer bias in the fully trained group which worked in their favour. This study has also been shown to have a bias in the fully trained group in that it consists of younger, less experienced drivers and in that those who usually drove (although not the group as a whole) had a different occupational status than the other groups.

Table 4.1.1 shows the number of accidents reported by each of the boys' and girls' groups. The most obvious features are of the larger number of accidents reported by the control groups and by the boys. Table 4.1.2 shows the accident rate per number of drivers in each of the four groups of boys and girls. It can be seen that these figures suggest that about 80% boys and 40% girls had been involved in an accident. The fully trained students, within both samples, had fewer accidents than any of the other groups. The pre-driver trained boys were involved in the greatest number of accidents. The differences within the boys' sample were significant at the 5% level. The control girls had the largest number of accidents, but the differences within the girls' sample were not significant. All the girls' groups were involved in fewer accidents than their male counterparts, and these differences were in all cases significant. In all cases, these rates are higher than those observed in the previous analysis (Raymond et al, 1973), which suggests that these rates are not stable over time.

It is perhaps pertinent at this stage to mention one of the lynch pins of this kind of research - namely the concept of statistical significance. There appears to be a tendency in the research literature to attribute surplus meaning to the concept of statistical significance. A test of significance provides information concerning the probability of committing an error in rejecting the null hypothesis. The fact that a test statistic is declared significant tells us nothing regarding the magnitude of the treatment effect or the practical importance of usefulness of the results. It is conventional to set the significance level at 5%, so as to minimise the occurrence of a Type I error (which occurs when one rejects the null hypothesis which in fact is true). However the probability of committing a Type II error (which occurs when one fails to reject the null hypothesis which in fact is false) is inversely related to Type I. Consequently, as both can be minimised at the same size only by increasing the size of the sample, the nature of the problem under study is the factor which ought to dictate which type of error is to be minimised. There are occasions when we feel it is more desirable to risk rejection of the null hypothesis when it is true. This may well be the case in accident or medical research i.e. when the consequences of the null hypothesis being wrong (e.g. that a treatment does prevent accidents) are very important. Thus if driver education does reduce accidents, but this reduction is only significant at the 20% level, it is more important to introduce driver education and reduce accidents and run the risk of it having little effect than ignoring the opportunity because the criterion has not satisfied the arbitrary 5% level.

In previous analyses relating to this study, the 5% level was retained because the criteria involved were not so important, given the high cost of driver education. One advantage of retaining a high probability of minimising the probability of rejecting the null hypothesis when it is true is that the experimental method also has its shortcomings. It is impossible in the social sciences to design measuring techniques which will not affect that which is being measured. The Hawthorne experiment (Mayo, 1933) demonstrated that the design of a proposed "treatment versus control" may turn out largely to be a test of any treatment versus lack of treatment. Indeed it is difficult to design an experiment which one could assert with confidence would have no effect at all on the subject's motivational level, attention, arousal, achievement, drive, etc. etc. since human beings are responsive to their environment. So that while no theory may link an experimental treatment A with outcome B, given a large enough sample and reliable enough test instrument, a significant level

Table 4.1.1 : The number of car accidents in each of the groups.

	Pre-Driver	Control	Full	Simulator	Total
Boys	98	187	149	13	447
Girls	9	80	45	6	140
Total	107	267	194	19	587

Table 4.1.2 : The accident rate per driver

	Pre-Driver	Control	Full	Simulator	Total	X^2
Boys:						
number of drivers	91	244	216	14	565	
accidents	98	187	149	13	447	
rate	1.03	0.76	0.69	0.93	0.79	$p < 0.05$
Girls:						
number of drivers	23	175	138	15	351	
accidents	9	80	45	6	140	
rate	0.36	0.46	0.33	0.40	0.40	$p > 0.05$
Total:						
number of drivers	114	419	354	29	916	
accidents	107	267	194	19	587	
rate	0.94	0.64	0.55	0.66	0.64	$p < 0.05$
X^2 boy/girl difference	$p<0.05$	$p<0.05$	$p<0.05$	$p>0.05$	$p<0.05$	

of B may be achieved as a result, for example, of heightened arousal. Thus the null hypothesis is nearly always likely to be false. Thus successfully achieving a statistical result of this sort can constitute only an extremely weak corroboration of any substantive theory.

In this study, the arbitrary 5% level of statistical significance has also been maintained. There are several reasons for this, the chief one being the reactive nature of the experiment and the consequent implications for the rejection of the null hypothesis as outlined above. In addition, it permits comparisons to be made between this and other studies relating to the efficacy of driver education since this is the conventional level of significance.

In the event of a statistically significant result, which merely indicates that an unlikely event has taken place, other things being equal (which of course in the social sciences, they rarely are), the practical importance of this result has to be demonstrated. The magnitude of the observed differences must be assessed in substantive terms. Even when statistically non-significant results occur i.e. where the null hypothesis was not rejected, some consideration should be given to the probability of correctly rejecting the null hypothesis i.e. rejecting it when it is in fact false. Thus the concept of the power of the test is also important. This should of course be taken into account at the design stage of the experiment so as to determine the desired sample size to realise these conditions. When the sample size is fixed by external constraints, then various post hoc approaches should be used.

Thus a very cursory inspection of the data relating to accident involvement shows that driver educated students had fewer accidents. A course of 30 + 5 is apparently worse than no formal instruction at all. When one considers that most of the American research evaluated the traditional course of '30 + 6' and found that such a course reduced the number of accidents, this result is very surprising. However, the conclusion cannot yet be drawn that driver education has had a beneficial effect on young people's accident records.

4.2 <u>The relationship between a course of driver education and the distribution of accident involvement among drivers</u>

Although it appears that a course in driver education reduces the likelihood of being involved in an accident for the group as a whole, the likelihood of any one individual being thus involved has not been shown to be affected. Table 4.2.1 shows the number and percentage of boys in each group who were not involved in an accident, approximately half of the boys had been involved in an accident. It can be seen that slightly fewer of the fully trained boys were not involved in a car accident. A chi-square test showed that these differences were not significant. It cannot therefore be said that the driver trained students were less likely to be involved in an accident. Again, comparing these results with earlier ones, more young drivers had been involved in an accident than was the case in the previous analysis.

Table 4.2.2 shows the number and percentage frequency distribution of accidents per driver for each of the girls' groups, less than one third of the girls had been involved in an accident. Slightly fewer of the control girls were accident free than any of the other groups, but again this difference was not significant. The girls also were more likely to have been involved in an accident when a longer time period is considered than a short time span.

When the boys and girls are compared, not only are the girls less likely to be involved in an accident, but they are also less likely to be involved in more than one accident. This may indicate that girls are more likely to learn from experience and are less likely to make the same mistake twice. It might also indicate that an accident deters a girl from driving again.

These different explanations can only be verified by examining the mileage rates of the two groups. Chi-square tests showed that the differences between the boys and girls were significant at the 5% level for all the groups.

This, to a certain extent, tends to explain the findings of the previous section; namely that the significantly higher accident rate per member of the pre-driver trained boys is accounted for by the fact that slightly more drivers were involved in one or more accidents. The girls had fewer accidents per group because they were less likely to be accident repeaters. Thus, it can be seen that great care has to be taken in the exact definition of the accident rates to be used when comparing groups. To conclude, the safer driving record of the driver trained group of boys as measured by the average accident rate is somewhat illusory and is accounted for by fewer accident repeaters. For discrete data such as accidents, the average obscures more than it reveals.

When these results are compared with those obtained in an earlier analysis, it can be seen that the differences between the proportions of male drivers who had been involved in one or more accidents in favour of those who had received the full course of driver education, have disappeared. (No differences were apparent within the girls' sample). The previous differences in accident involvement were accounted for by factors other than driver education and appear to be somewhat transient.

As it has been shown that not all of those who have a full licence to drive, actually drive, these accident rates were adjusted for the number who reported that they usually drove. It should be remembered that this number was calculated from the number who claimed that they usually drove when contact was last made with them. It is possible that some of those who said that they did not usually drive, used to drive and had had an accident several years prior to the last contact. This figure is therefore only an approximate rate.

Table 4.2.3 therefore shows the adjusted accident rate. It can be seen that slightly more of the control boys were not involved in an accident than any of the other groups, but the differences are not significant. The differences between the girls' groups are slightly larger, favouring the trained groups, but again these differences are not significant. Generally, although not in every case, the difference between the boys' and girls' was significant.

When these rates are compared with those noted in Tables 4.2.1 and 4.2.2, it can be seen that fewer of the drivers are accident free. Thus accidents are tied to whether or not they are driving and the more a group drives, the more likely it is to have accidents. This tends to suggest that it is not very meaningful to discuss accidents in relation to the driver, but rather in relation to the amount of driving he does, i.e. to his exposure to risk.

When these results are compared with those obtained in an earlier analysis, again the differences between the groups of male drivers who have been involved in one or more accidents have disappeared. Thus the accident involvement of a group of drivers alters with time. While it is difficult to know precisely what such a variable, time, means, it seems most likely to refer to the increase in mileage that takes place with time, rather than the maturation process associated with increased age since the accident involvement for the groups increased when only those who actually drive are considered. Since accident rates vary with time, they cannot be said to represent a very stable characteristic of people's driving and limit the reliance that can be placed on the use of accidents per driver or even upon the distribution of accidents among drivers.

Tables 4.2.1 and 4.2.2 were further examined in order to ascertain whether the probability of an individual's being involved in one or more accidents was greater than could be expected by chance. If the distribution of accidents

among drivers is entirely random, then one would expect the distribution to be approximately the same as the Poisson distribution which is based on the concept of equal liability (Kendall). However, it is not clear the extent to which this distribution is applicable given that the likelihood of having an accident may not be independent of previously being so involved.

Tables 4.2.4 and 4.2.5 show the observed and expected distribution of accidents for each of the boys' and girls' groups respectively. It can be seen that the observed distributions are almost exactly the same as the expected distribution. Chi-square tests showed that the differences were not significant.

The conclusion must therefore be drawn that an individual's chance of being involved in one or more accidents is entirely random and training has little effect on this. There is no evidence to suggest that there are any individuals who are accident prone, namely that in their personality there are any predisposing characteristics which would make them more susceptible to being involved in road accidents. These results tend to suggest that while many factors may interact to cause an accident, such as road, weather and vehicle conditions, personality, inexperience and age, and affect the overall number of accidents, the number of accidents in which any one individual is involved is entirely due to chance. However this concept of accident proneness is one which has raised considerable discussion and has been the subject of much research. Shaw and Sichel (1971) made an effort to sort out the confusion in scientific thinking on this subject.

It has frequently been stated that personality and attitudes play an important part in safe driving. There is a substantial body of research evidence relating predispositions characterised by aggression, conformity, impulsiveness etc. to obtained accident data. There is similar research evidence connecting various temperamental and personality characteristics and traits. Nevertheless, the precise way in which these parameters engage and influence task performance and other aspects of vehicles' use is still obscure. Hence although it is possible to identify the general nature of these attitudes which are associated with an accident free driving record, it is less easy to specify which aspects of vehicle use (control, use, mileage etc.) are primarily being influenced or under which driving conditions. Evidence from those studies which have been carried out in sufficient detail does suggest that a major effect is exerted on the inter-active aspects of driving, i.e. on the way drivers perceive and react to others. However, a full analysis of attitudes relating to these and other characteristics of vehicle use and to other conceptually similar constructs, such as beliefs and values, has yet to be done.

Insofar as the individual driver's involvement in a road accident appears to be entirely random, it would suggest that there is little to be gained at this stage by investigating the characteristics of the driver, as an individual. Such results relating to the comparison of accident rates for the group of drivers as a whole and for those who actually drive, suggest that a more fruitful line of investigation would be into the activity of driving, i.e. a study of individual's involvement in accidents relative to the amount of driving he does.

4.3 The relationship between a course of driver education and the accident rate per mile

Since the fully trained group were shown to have driven fewer miles than the other groups, and previous research has shown that exposure to risk is an important variable (Burg, 1967, 1968 and 1973; Coppin et al, 1965; Coppin et al, 1967; Harano et al, 1973; Carroll, 1971), accident rates per 1,000 miles

Table 4.2.1 : Percentage of drivers in each of the boys' groups who had been involved in an accident

Boys	Pre-Driver		Control		Full		Simulator		Total		X^2
Total number of drivers	91		244		216		14		565		
Drivers not involved in an accident	36	40%	123	50%	111	51%	5	36%	275	49%	$p > 0.05$
Involved in:											
1 accident	28	31%	78	32%	74	34%	6	43%	186	33%	
2 accidents	17	19%	31	13%	25	11%	2	17%	75	13%	
3 accidents	5	5%	6	2%	5	2%	1	8%	17	3%	
4 accidents	4	4%	2	1%	0	0%	0	0%	6	1%	
5 accidents	1	1%	3	1%	0	0%	0	0%	4	1%	
6 accidents	0	0%	1	1%	0	0%	0	0%	1	0%	
7 accidents	0	0%	0	0%	0	0%	0	0%	0	0%	
8 accidents	0	0%	0	0%	1	1%	0	0%	1	0%	

Table 4.2.2 : Percentage of drivers in each of the girls' groups who had been involved in an accident

Girls	Pre-Driver		Control		Full		Simulator		Total		X^2
Total number of drivers	23		175		138		15		351		
Drivers not involved in an accident	16	70%	118	68%	103	75%	10	67%	247	70%	$p > 0.05$
Involved in:											
1 accident	5	20%	42	24%	27	20%	4	27%	78	22%	
2 accidents	2	8%	10	6%	7	5%	1	7%	20	6%	
3 accidents	0	0%	2	1%	0	0%	0	0%	2	1%	
4 accidents	0	0%	3	2%	1	1%	0	0%	4	1%	

Table 4.2.3 : Percentage of drivers who were involved in an accident, adjusted for the number who normally drove.

	Pre-Driver	Control	Full	Simulator	Total	X^2
Boys:						
Who normally drove	73	202	168	11	454	
Involved in 1 or more accidents	55 75%	121 60%	105 62%	7 64%	288 63%	$p > 0.05$
Not involved in an accident	18 25%	81 40%	63 38%	4 36%	166 37%	
Girls:						
Who normally drove	16	112	80	12	220	
Involved in 1 or more accidents	7 43%	57 51%	35 44%	5 42%	104 47%	$p > 0.05$
Not involved in an accident	9 57%	55 49%	45 56%	7 58%	116 53%	
Boy/girl difference	$p < 0.05$	$p > 0.05$	$p < 0.05$	$p > 0.05$	$p < 0.05$	

Table 4.2.4 : Comparison of observed and expected frequency distribution (Poisson) of accidents among male drivers.

BOYS	Pre-Driver		Control		Full		Simulator		Total	
Total number of drivers	91		244		216		14		565	
	O	E	O	E	O	E	O	E	O	E
Drivers not involved in an accident	36	30	123	110	111	107	5	6	275	253
Involved in:										
1 accident	28	33	78	87	74	73	6	5	186	200
2 accidents	17	18	31	34	26	26	2	2	75	80
3 accidents	5	6	6	10	5	7	1	1	17	25
4 accidents	4	2	2	2	0	2	0	0	6	6
5 accidents	1	1	3	1	0	1	0	0	4	1
6 accidents	0	0	1	0	0	0	0	0	1	1
7 accidents	0	0	0	0	0	0	0	0	0	1
8 accidents	0	0	0	0	1	0	0	0	1	0
X^2	3.96		8.33		3.50		0.30		5.89	
Degrees of freedom	4		5		4		2		7	
p	> 0.05		>0.05		>0.05		>0.05		>0.05	

Table 4.2.5 : Comparison of observed and expected frequency distributions (Poisson) of accidents among female drivers

GIRLS	Pre-driver		Control		Full		Simulator		Total	
Total number of drivers	23		175		138		15		351	
	O	E	O	E	O	E	O	E	O	E
Drivers not involved in an accident	16	15	112	110	103	99	10	10	247	238
Involved in:										
1 accident	5	7	42	50	27	32	4	4	78	94
2 accidents	2	1	10	12	7	5	1	1	20	18
3 accidents	0	0	2	2	0	1	0	0	2	4
4 accidents	0	0	3	0	1	0	0	0	4	0
X^2	1.00		2.05		2.74		0.00		4.28	
Degrees of freedom	1		3		3		1		3	
p	>0.05		>0.05		>0.05		>0.05		>0.05	

were calculated.

Table 4.3.1 shows the accident rates for each of the boys' and girls' groups. It can be seen that there is very little variation between the four groups of boys - although the control boys have a slightly safer record. The differences are not significant. There is more variation within the girls' sample, with the fully trained group having the highest accident rate per mile travelled. Again these differences are not significant. Therefore, the conclusion must be drawn that there is no evidence to suggest driver education has had any effect on the average number of accidents per 1,000 miles.

When the girls and boys are compared, it can be seen that the girls have a higher accident rate per mile than the boys. These differences were significant for the two large groups and the samples as a whole. When these results are compared with those found in the earlier analysis, it can be seen that the accident rates are substantially lower, thereby confirming the role of experience in the ability to avoid becoming involved in an accident.

It is interesting that these results, with broad similarity within the samples show a similar picture of the relative safety of the various groups, particularly when compared with the distribution of accidents among drivers who usually drove. Figures 4.3.1 and 4.3.2 show the accident frequency plotted against mileage for the boys and girls respectively. It can be seen that this declines as mileage increases.

When these average accident rates per mile are compared with those obtained in the previous analysis, it can be seen to be approximately half in the case of both the boys and the girls, i.e. they have declined considerably over time although consistently so for all the groups. This suggests that these rates are not stable and raises the question whether they can serve as reliable criteria for evaluating program effectiveness.

The implication of these average accident rates per 1,000 miles is that these rates are linear and that if the average rate is one accident per 10,000 miles, then one would expect to be involved in 10 accidents in 100,000 miles. Previous analysis has shown that this is not the case and this analysis has shown that these rates have declined since then. Table 4.3.2 shows the accident rates per 5,000 miles for different ranges of mileage. The accidents in each group of 5,000 miles actually occurred during this period in the driving history of all those drivers who had covered this range. This table therefore shows the average accident rate at different stages in a person's driving experience. Figures 4.3.3 and 4.3.4 show these results for the boys and girls in graph form. From this it can be seen that the accident rate declines with every 5,000 miles covered. In other words, the risk declines with experience. The boys' rate has flattened out by about 35,000 miles, but starts to rise again at about 70,000 miles. It is difficult to interpret the latter half of the table because of the small number of people who had ever driven over 70,000 miles. The girls' rate flattens out by about 20,000 and then starts to rise again at about 30,000 miles. But again this is difficult to interpret as so few have driven such a high mileage. It will be seen that there is very little difference within the boys' and girls' samples. There were no significant differences within the samples for any of the mileage ranges, but the accident rate within the 0-5,000 mileage range (although at no other range) for all the girls was significantly greater than that of the boys.

The fact that the accident rates declined with experience was contrary to what one would expect from the previously calculated average accident rate which implies a constant. The null hypothesis of equality between the accident rates per mile was tested. The accident rates per 5,000 mile

range travelled were not found to be the same for all ranges of mileage. In other words, the linear accident rate per mile is not accurate enough in predicting the accident rate for inexperienced drivers, i.e. the average accident obscures more than it reveals. Figure 4.3.5 shows the observed and expected accident frequencies per 5,000 mile range. The average rate is usually used to predict accidents because the population's previous mileage is not known. In any case, the average rate may well be applicable for the population as a whole since this includes experienced as well as inexperienced drivers.

A course of driver education does not therefore appear to affect the accident rate per mile. However, since it has been shown that the likelihood of being involved in an accident depends on the number of miles previously travelled, it is likely that the slightly higher average accident rate of the fully trained group is explained by the fact that in total they have covered a lower mileage. This is plausible since there is no difference between the groups within any of the mileage ranges.

The girls' overall rate for the first 5,000 miles is significantly higher than the overall boys' rate. Even within this mileage range the girls had driven fewer miles than the boys. It seems quite likely that this first 5,000 miles constitutes a very important learning period and that if this were further subdivided, the first 1,000 miles would be more dangerous than the fifth 1,000 miles. As the girls had driven fewer miles, it can be seen from Figure 4.3.5 that most accidents took place during the first 3,000 miles. It may therefore be that comparing the boys' and girls' accident rates in the first 5,000 miles is not comparing like with like, but the boys' rate in the 0-5,000 miles range with the girls' rate in the 0-3,000 mile range.

When the observed accident rates per mile in Figure 4.3.5 are compared with a similar graph in the previous analysis, it can be seen that the curve starts at a lower point and declines more gradually. Thus once again, it is difficult to specify anything with any certainty about the relationship between accidents and mileage other than that they are inversely related.

The question is raised as to what it is exactly that mileage is measuring. This was discussed with the problem of exposure to risk (Shaoul, 1975) where it was found that total mileage was associated with their age, length of time they had been driving, weekly mileage, the purpose and length of most of their journeys. In so far as it is an accurate estimate of their mileage, an assumption that cannot be verified, it represents the sum total of the drivers' actions.

The accident rate per mile is a more relevant criterion than the rate per driver which has been used in many of the American studies. The trained group's superiority is no longer apparent. This analysis has confirmed that the accident rate per group or per driver does not accurately reflect the group's relative safety. It has also shown that even the average accident rate per mile does not accurately reflect the group's safety. Other rates have been calculated which show the trained groups to have a similar record to the other groups and the girls to have an inferior record to the boys. Another finding to emerge from this study has been some evidence to support the idea of a learning period during which a driver gradually becomes less vulnerable as he gains experience. The curves in Figure 4.3.5 are very similar to the conventional learning curve.

However, while this is discernable from the data, it is difficult to specify what is being learned. It would tend to suggest that a driver requires considerable practice to become a skilled and safe (that is, an accident free) driver. Since a learning and adjustive process occurs even after taking the

test, it follows that it ought to be possible for an appropriately designed course of instruction to reduce this learning period, in terms of miles travelled. In many fields it is possible to learn from a trial and error approach, a completely new skill, but this task can be mastered very much quicker when fundamental principles are first acquired. In the case of driving, it seems that very little emphasis is placed on teaching the principles of safe practices rather than driving as a system of rules. By concentrating less on the principles than on the procedures, the emphasis is on the individual rather than his interaction with his physical and social environment, and the anticipation of other road users' actions becomes more difficult. The aim of any driver preparation course must be to reduce this vulnerable learning period by helping novice drivers to become skilled in dealing with traffic conditions.

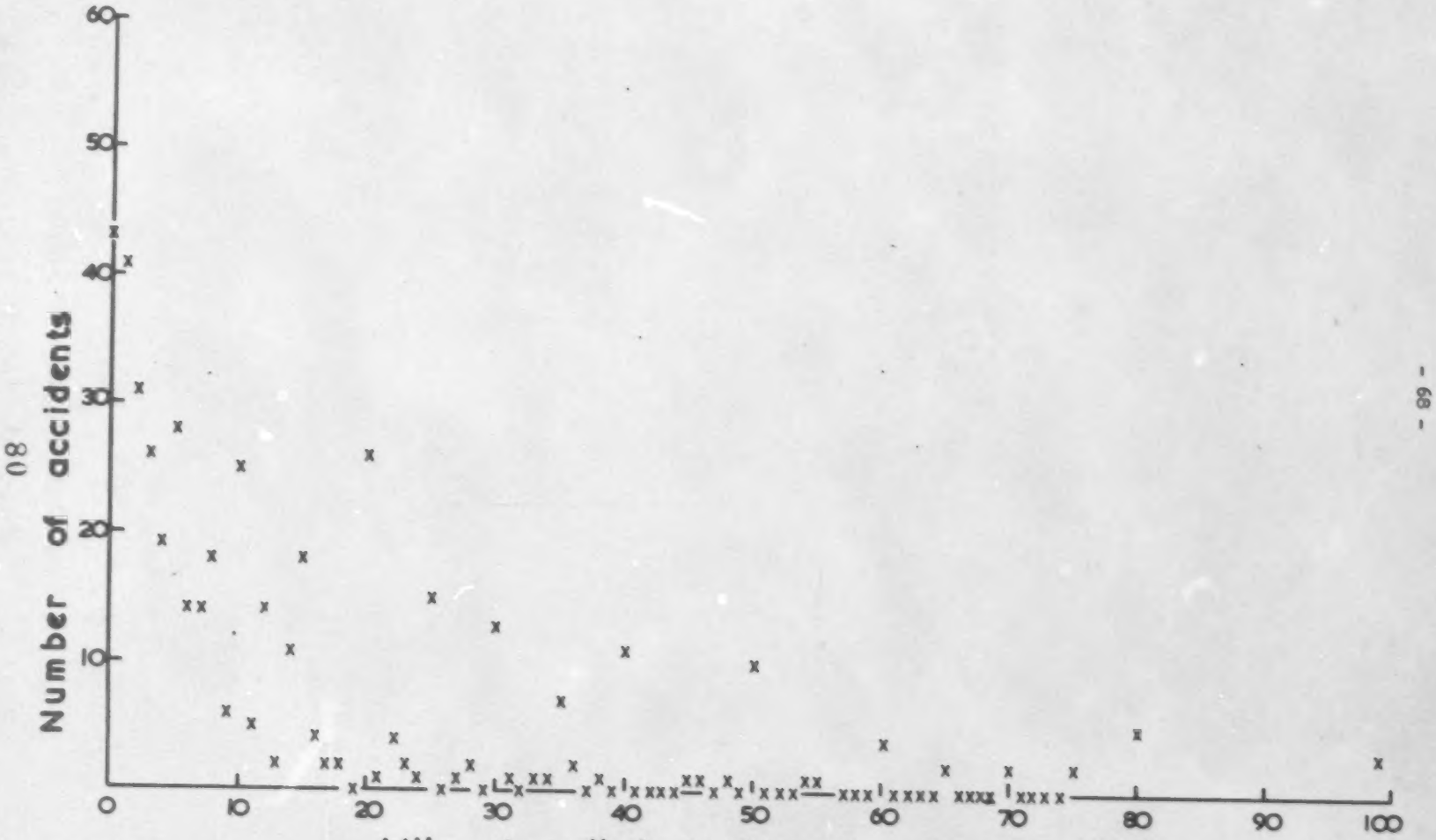
It seems likely that the control and pre-driver trained drivers were likely to be involved in one or more accidents than the fully driver trained groups because they have been driving longer. Similarly the boys were involved in more accidents per driver than the girls because they had driven further. When the accident rates per 5,000 mile range travelled of the control group are used to predict the number of accidents when the fully trained group had covered a similar mileage (at the same levels of experience), the accident rate per driver is almost identical to that of the control group and the average accident rate per mile is of course also identical. Although it does not necessarily follow that there will be the same distribution of accidents among drivers, it seems likely that if the higher accident rate for the girls is due to a lower mileage at the early stage in acquiring experience, then accident rates may be very similar to the boys when they have driven as far as the boys. From this it may be seen that the fully trained groups' superior record with regard to accidents per driver is a reflection of their lower mileage and exposure to risk rather than an indication of their superior driving performance.

It is difficult to interpret the second upward trend in accidents. It may be due to inadequacies in the sample size. A similar upward trend, at 20,000 miles was noted in the previous analysis and by continuing the follow up studies, it becomes clear that the downward trend does in fact continue for the mileage range which was previously in doubt. Thus the second peak noted in that analysis between 20-30,000 miles does not accurately reflect the driving experience of this group of young people. It seems likely that the second upward trend noted in this analysis is also due to sampling problems. A word should also be added here about the very erratic nature of the latter end of the curves in Figure 4.3.4. To a certain extent this is due to the fact that after about 25,000 miles, the students tended to give their total mileage estimates in tens of thousands rather than in units. This is only to be expected as mileage increases, since one's ability to make such fine distinctions declines. When accidents are calculated for 10,000 mile ranges, rather than 5,000 mile ranges, the curve is very much smoother and a continuous downward trend is apparent.

Thus it is very difficult to draw any conclusions about the effect of driver education on accident records after several years since such factors as sex of the driver and experience appear to play a much more important part than training.

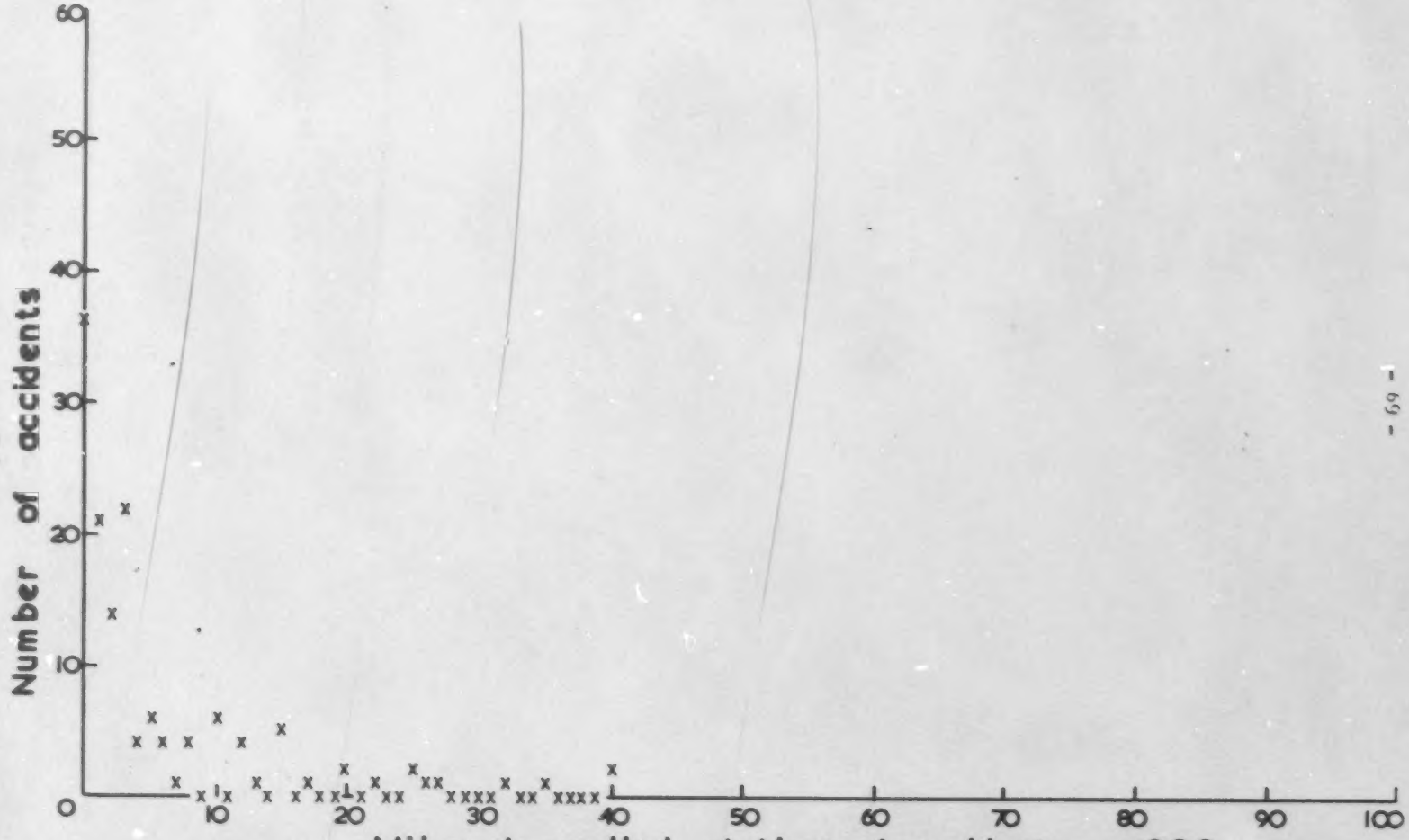
4.4 The relationship between a course of driver education and the accident rate per month of driving experience

It has been shown earlier (Shaoul, 1975) that the fully trained group were more likely to be driving irregularly and at infrequent intervals than any of the other groups and that this pattern of driving was more characteristic of the girls' driving than the boys'. When their mileage was adjusted for the



FREQUENCY DISTRIBUTION OF THE MALE DRIVER'S ACCIDENTS & MILEAGE DRIVEN

FIGURE 4.3.1



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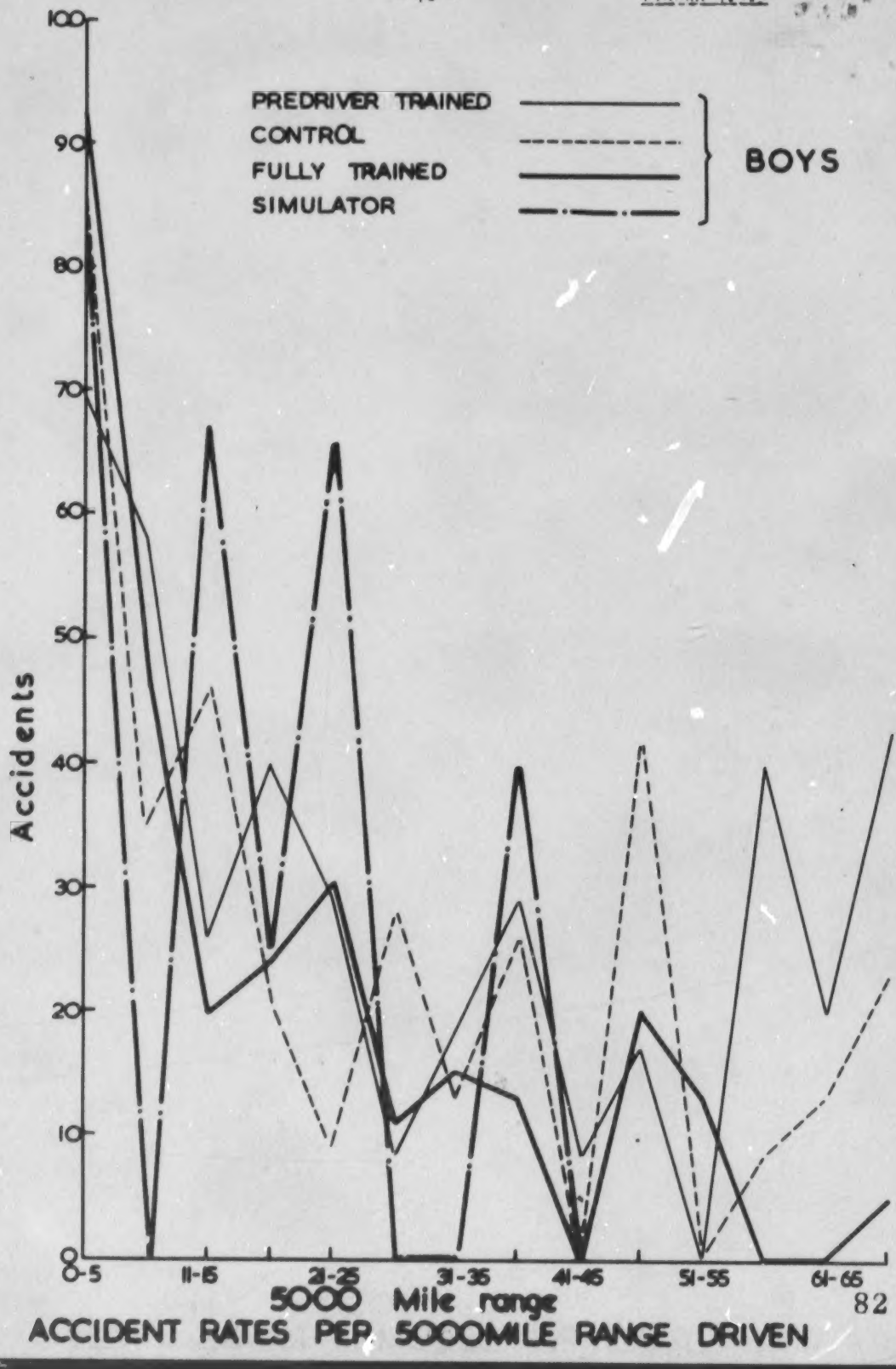
FREQUENCY DISTRIBUTION OF THE FEMALE DRIVERS ACCIDENTS & MILEAGE DRIVEN

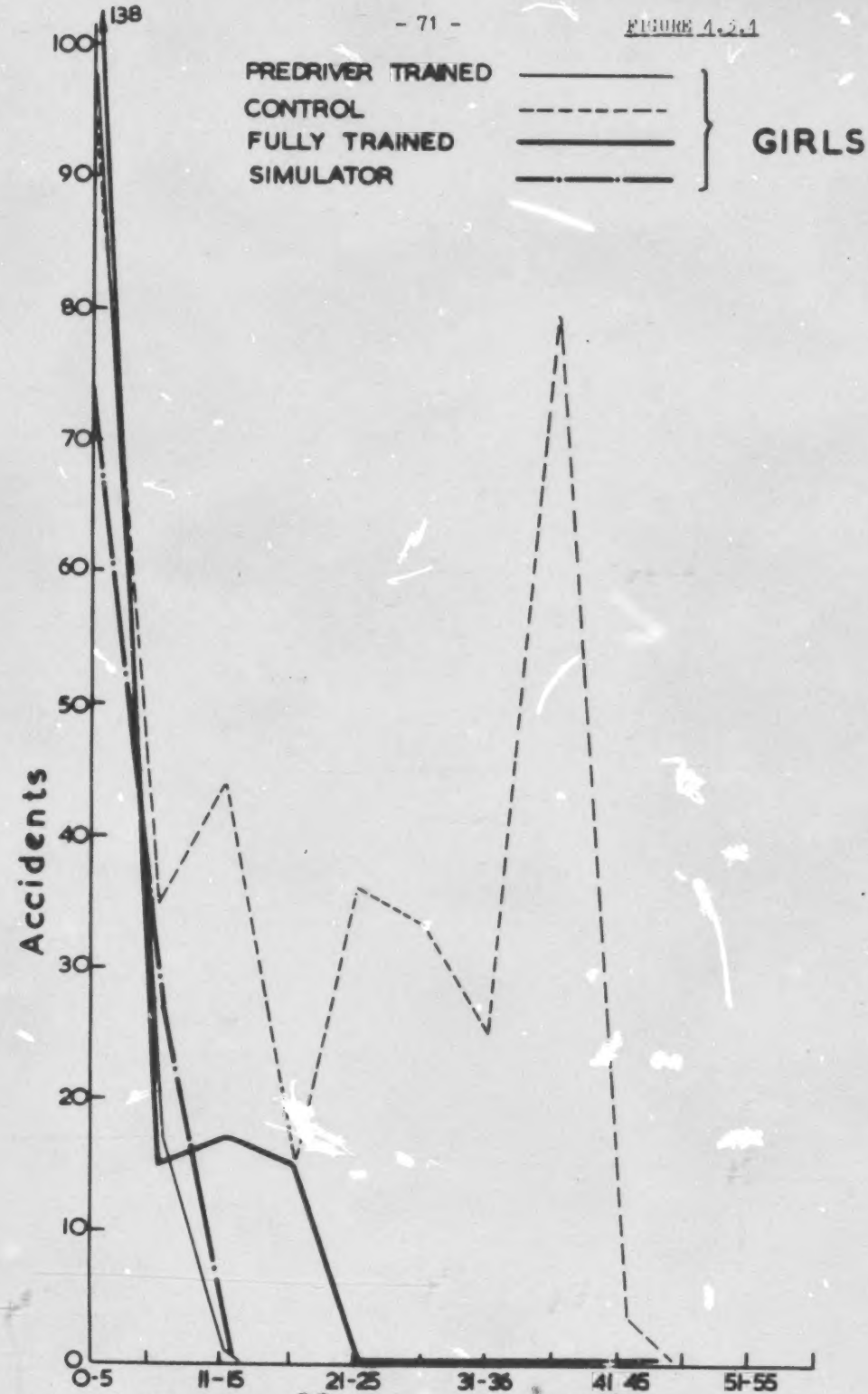
TABLE 4.3.2

FIGURE 4.2.3



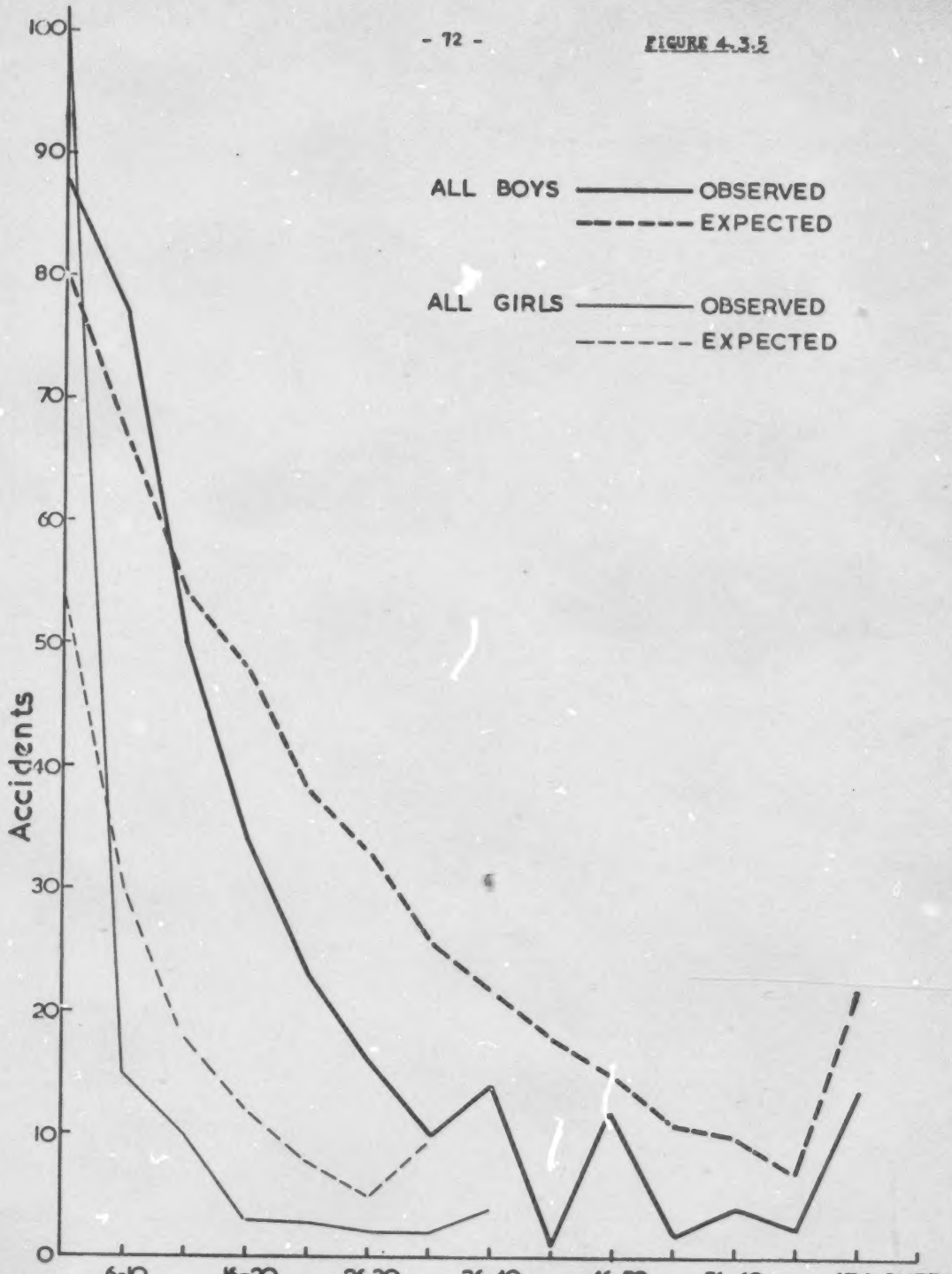
ACCIDENT RATES PER 5000MILE RANGE DRIVEN

FIGURE 4.2.1



ACCIDENT RATES PER 5000MILE RANGE DRIVEN.

FIGURE 4.3.5



OBSERVED AND EXPECTED FREQUENCY DISTRIBUTION OF ACCIDENTS PER 5000 MILE RANGE DRIVEN

Table 4.3.1 : Accident rates per 1000 miles

	Pre-driver	Control	Full	Simulator	Total	X^2
Boys:						
Accidents	98	187	149	13	447	
Total mileage ('000) driven by group	2732	5236	3998	348	12314	
Accident rate	0.0359	0.0357	0.0372	0.0374	0.0363	$p > 0.05$
Girls:						
Accidents	9	80	45	6	140	
Total mileage ('000) driven by group	258	1448	598	158	2462	
Accident rate	0.0349	0.0552	0.0753	0.0380	0.0569	$p > 0.05$
X^2 boy/girl difference	$p > 0.05$	$p < 0.05$	$p < 0.05$	$p > 0.05$	$p < 0.05$	

Table: 4.3.2 : Accident rate per 5,000 mile range travelled.

Mileage		Boys						Girls				
		Pre	Con	Full	Sim	Total		Pre	Con	Full	Sim	Total
0-5,000	accidents	29	77	77	5	188		8	50	41	4	103
	miles	414	925	832	58	2229		82	520	296	54	952
	rate	.0700	.0832	.0925	.0862	.0843		.0976	.0962	.1385	.0740	.1081
5-10,000	accidents	21	27	29	0	77		1	11	2	1	15
	miles	357	761	630	50	1848		59	312	129	36	536
	rate	.0588	.0354	.0460	.0000	.0417		.0169	.0352	.0155	.0278	.0280
10-15,000	accidents	8	29	10	3	50		0	9	1	0	10
	miles	305	636	506	45	1492		29	203	57	27	316
	rate	.0262	.0456	.0198	.0667	.0335		.0000	.0443	.0175	.0000	.0316
15-20,000	accidents	11	11	11	1	34		0	2	1	0	3
	miles	278	541	451	40	1310		25	137	32	16	210
	rate	.0396	.0203	.0244	.0250	.0260		.0000	.0146	.0313	.0000	.0143
20-25,000	accidents	7	4	10	2	23		0	3	0	0	3
	miles	244	455	325	30	1054		15	83	27	15	140
	rate	.0287	.0088	.0308	.0666	.0218		.0000	.0361	.0000	.0000	.0214
25-30,000	accidents	2	11	3	0	16		0	2	0	0	2
	miles	215	400	279	25	919		15	60	11	5	91
	rate	.0093	.0275	.0108	.0000	.0174		.0000	.0333	.0000	.0000	.0219
30-35,000	accidents	3	4	3	0	10		0	1	0	1	2
	miles	165	313	200	25	703		10	40	5	5	60
	rate	.0182	.0127	.0150	.0000	.0142		.0000	.0250	.0000	.0200	.0333
35-40,000	accidents	4	7	2	1	14		0	2	0	0	2
	miles	137	274	159	25	595		10	25	5	0	40
	rate	.0292	.0255	.0126	.0400	.0235		.0000	.0800	.0000	.0000	.0500
40-45,000	accidents	1	0	0	0	1		0	0	0	0	0
	miles	125	249	115	15	504		5	20	5	0	30
	rate	.0080	.0000	.0000	.0000	.0019		.0000	.0000	.0000	.0000	.0000
45-50,000	accidents	2	8	2	0	12		0	0	0	0	0
	miles	120	193	101	10	424		5	14	5	0	24
	rate	.0167	.0415	.0198	.0000	.0183		.0000	.0000	.0000	.0000	.0000
50-55,000	accidents	0	0	1	1	2		0	0	0	0	0
	miles	85	120	75	10	290		0	10	0	0	10
	rate	.0000	.0000	.0133	.1000	.0069		.0000	.0000	.0000	.0000	.0000

	Boys						Girls				
	Pre	Con	Full	Sim	Total		Pre	Con	Full	Sim	Total
55-60,000 accidents	3	1	0	0	4		0	0	0	0	0
miles	75	115	70	5	265		0	10	0	0	10
rate	.0400	.0087	.0000	.0000	.0150		.0000	.0000	.0000	.0000	.0000
60-65,000 accidents	1	1	0	0	2		0	0	0	0	0
miles	50	80	55	5	200		0	0	0	0	0
rate	.0200	.0125	.0000	.0000	.0100		.0000	.0000	.0000	.0000	.0000
65-70,000 accidents	1	1	0	0	2						
miles	50	72	49	5	176						
rate	.0200	.0139	.0000	.0000	.0114						
70-75,000 accidents	1	1	0	0	2						
miles	30	55	35	0	120						
rate	.0333	.0182	.0000	.0000	.0167						
75-80,000 accidents	1	1	0	0	2						
miles	20	40	30	0	90						
rate	.0500	.0250	.0000	.0000	.0222						
80-85,000 accidents	4	1	0	0	5						
miles	20	25	25	0	70						
rate	.2000	.0400	.0000	.0000	.0714						
85-90,000 accidents	0	0	0	0	0						
miles	15	25	25	0	65						
rate	.0000	.0000	.0000	.0000	.0000						
90-95,000 accidents	0	0	0	0	0						
miles	15	20	25	0	60						
rate	.0000	.0000	.0000	.0000	.0000						
95-100,000 accidents	0	2	1	0	3						
miles	12	16	20	0	48						
rate	.0000	.1250	.0500	.0000	.0625						

length of time they had been driving, it was found to be lower than for the other groups. Previous analysis of the interrelationship of driving practices showed that the length of time they had been driving was determined, to a certain extent, by their age, and that it, in turn, determined their total mileage. In order to see whether this had any effect on the number of accidents, the accident rates per month of driving experience were calculated.

Table 4.4.1 shows the average accident rate per month of driving experience for each of the groups. It can be seen that the fully trained boys had slightly fewer accidents per month of driving experience than the other groups in the boys' sample. This is to be expected since they drove fewer miles per month than the other groups. The control girls had more accidents per month than did any of the trained groups in the girls' sample. None of these differences were significant. The table also shows whether the boy/girl differential with respect to these accident rates were significant. Except in the case of the simulator trained groups, these differences were significant, i.e. the girls had fewer accidents per month of experience than did the boys. Figures 4.4.1 and 4.4.2 show the accident frequency plotted against experience for boys and girls respectively. It can be seen that this declines as experience increases.

When these average accident rates per month of driving experience are compared with those obtained in the previous analysis (Shaoul, 1972), it can be seen to be approximately two-thirds those of the previous rates for the boys and girls, i.e. they have declined considerably over time, although fairly consistently for each of the groups. This suggests that these rates are not stable and raises the question whether they conserve as reliable criteria for evaluating program effectiveness.

Table 4.4.2 shows the accident rates per 6 months of driving experience for different ranges of experience. This table shows the accident rate in any 6 month period for those who have already been driving for x months. From this table, it can be seen that the likelihood of being involved in an accident declined as experience increased. There were no significant differences within either the boys' or girls' sample for any level of experience. The girls' rates were lower than the boys, although only in the 7-12 and 19-24 month periods were these differences significant. Figures 4.4.3 and 4.4.4 show Table 4.4.2 in a graphial form for the boys and girls respectively. The overall downward trend is very marked. The analysis carried out in 1972 suggested a second upward trend, but as this is not borne out by these figures, it must be concluded that this was due to a very small sample at that level of experience.

The null hypothesis of equality between accident rates per 6 months of driving experience was tested. The accident rate was not found to be the same for all ranges of experience. Figure 4.4.5 shows the observed and expected frequency distribution of accidents per 6 months of experience. Again it has been shown that the average accident rate is not accurate enough in predicting the number of accidents for new drivers, since this rate is non-linear.

From this analysis, it would appear that since the accident rates per 5,000 miles are the same within each sample (boys and girls), even though the groups differ in the time it took to cover that mileage, that the frequency and regularity of driving has little effect on the accident rate per 5,000 miles. It would appear that it is the total amount of experience which is important, where experience is defined as the total distance covered. This would imply that the level of proficiency in driving remains constant rather than regressing between infrequent practice. In fact, further consideration suggests that those who drove infrequently will have contributed very little to the total mileage, especially after the first 5,000 miles. It seems likely that the

average mileage per month for the trained group, calculated elsewhere (Shaoul, 1975) considerably underestimates the average for those who usually drive since it is weighted by the total number of months of experience of the whole group, rather than just of those who actually drove. Therefore the effect of infrequent practice is not being reflected to any substantial degree in the accident rates per mile and no conclusions can consequently be made about the role of practice in acquiring skill. It seems to make little difference whether the average weekly mileage is high or low. If the new drivers drove infrequently, their accident rate per month will be lower but it will not affect their accident rate per mile. Experience - that is skill - appears to be acquired by practice as defined by mileage. Since it takes time to cover this mileage, the experience (time) accident curve is broadly similar to the experience (distance) curve. In the case of the fully trained boys, because they are driving fewer miles per month, their experience (time) curve is lower and flatter than that of the other groups. Presumably, at a later stage in their driving career, their curve will stay higher for longer than the other groups. However, if the accident rates per 5,000 miles do tend towards zero, as drivers become more experienced, the fully trained boys' accident rates per 6 months experience will also tend towards zero.

It is also of interest that according to this rate, the fully trained groups are slightly safer than the other groups, and that the girls are safer than the boys. This would suggest that the relationship between the number of miles driven and the number of months since passing the test is not a very strong one. This rate describes accidents along a time dimension rather than a distance dimension. It reflects another aspect of the accident situation. It is useful because the data upon which these rates are based are very much more accurate than are the accident rates per mile because of the previously mentioned difficulties in estimating mileage.

Again while it is possible to discern a downward trend in accidents as the length of time since qualifying as a driver increases, the trend is not as marked as in the case of the relationship of accidents and mileage. This would tend to suggest that such learning as takes place in the ability to avoid becoming involved in an accident, is acquired directly through the practice of driving rather than indirectly from all the interaction with the road system, (as a driver, pedestrian, passenger etc.), maturation, etc., implied by the relationship with time. This seems to be substantiated by the fact that the fully trained groups' curves were lower and flatter than the other groups since they are known to have driven fewer miles per month of driving experience. Therefore even though driver education in the short term results in an increase in the number of drivers, because they drive less than the other groups and this is related to accidents, their accident rate per 6 months of driving experience is lower. i.e. It has not increased the number of accidents in the same proportion as the number of drivers because driver education also resulted in a lower mileage.

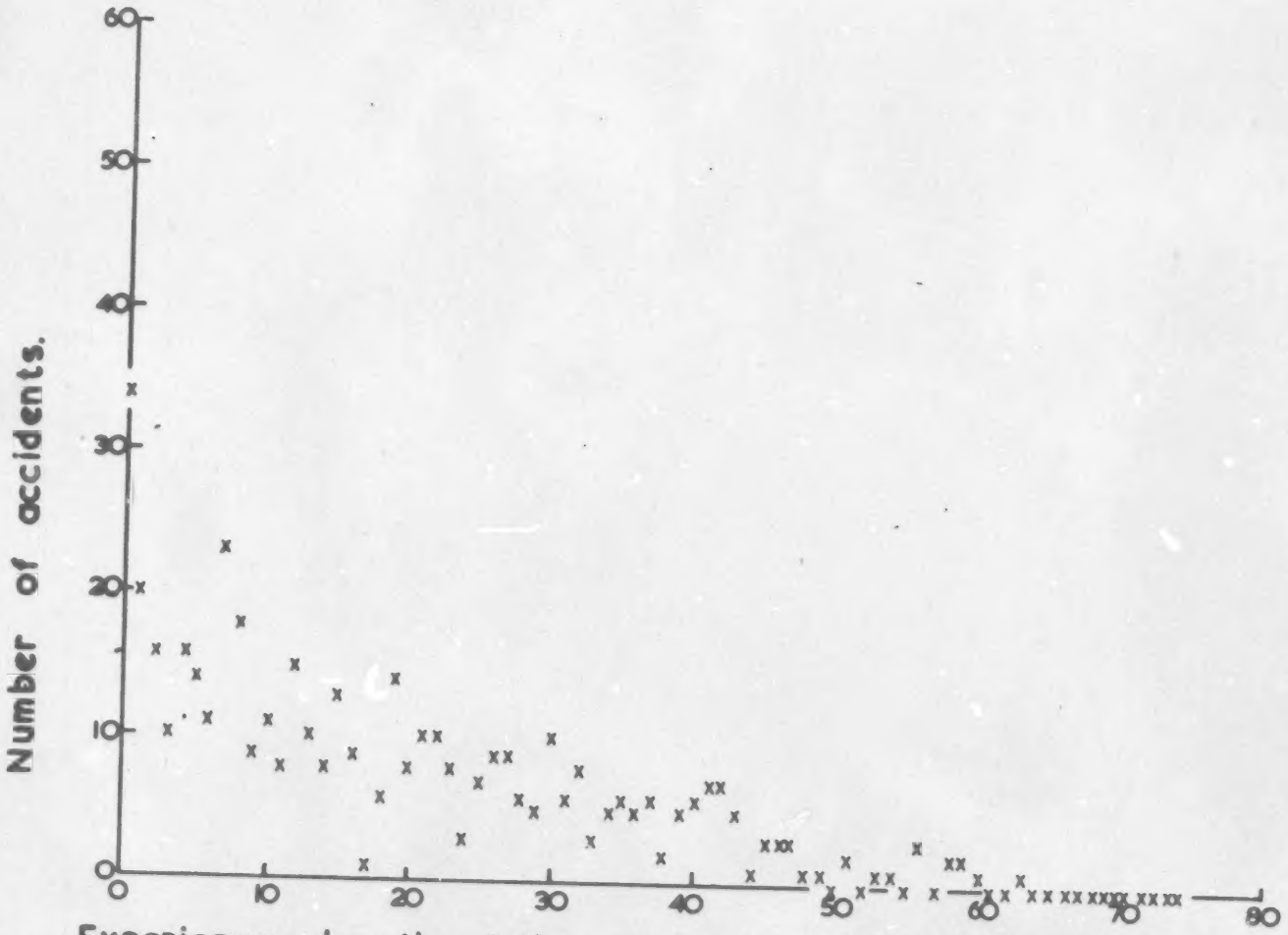
When Figure 4.4.5 is compared with the similar graph in the previous analysis, it can be seen that these accident curves take much longer to decline. Thus once again it is difficult to specify with any certainty anything about the relationship between the length of time since qualifying as a driver and accidents, other than that they are inversely related. While it may be inferred that learning takes place, it is difficult to ascertain what in fact has been learned.

Thus to conclude, although there is some indication that driver education has resulted in fewer accidents per month of driving experience in the first eighteen months after learning to drive, this appears to be accounted for by another factor, namely their lower mileage per month of experience, rather than by driver education per se.

Table 4.4.1 : Average accident rate per month of driving experience

	Pre-driver	Control	Full	Simulator	Total	X^2
Boys:						
Number of accidents	98	187	149	13	447	
Total months of driving experience	4111	8884	7919	584	21498	
Rate per month	0.0238	0.0210	0.0188	0.0222	0.0208	$p > 0.05$
Girls:						
Number of accidents	9	80	45	6	140	
Total months of driving experience	974	5816	4635	566	11991	
Rate per month	0.0092	0.0140	0.0097	0.0106	0.0118	$p > 0.06$
X^2 boy/girl difference	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p > 0.05$	$p < 0.05$	

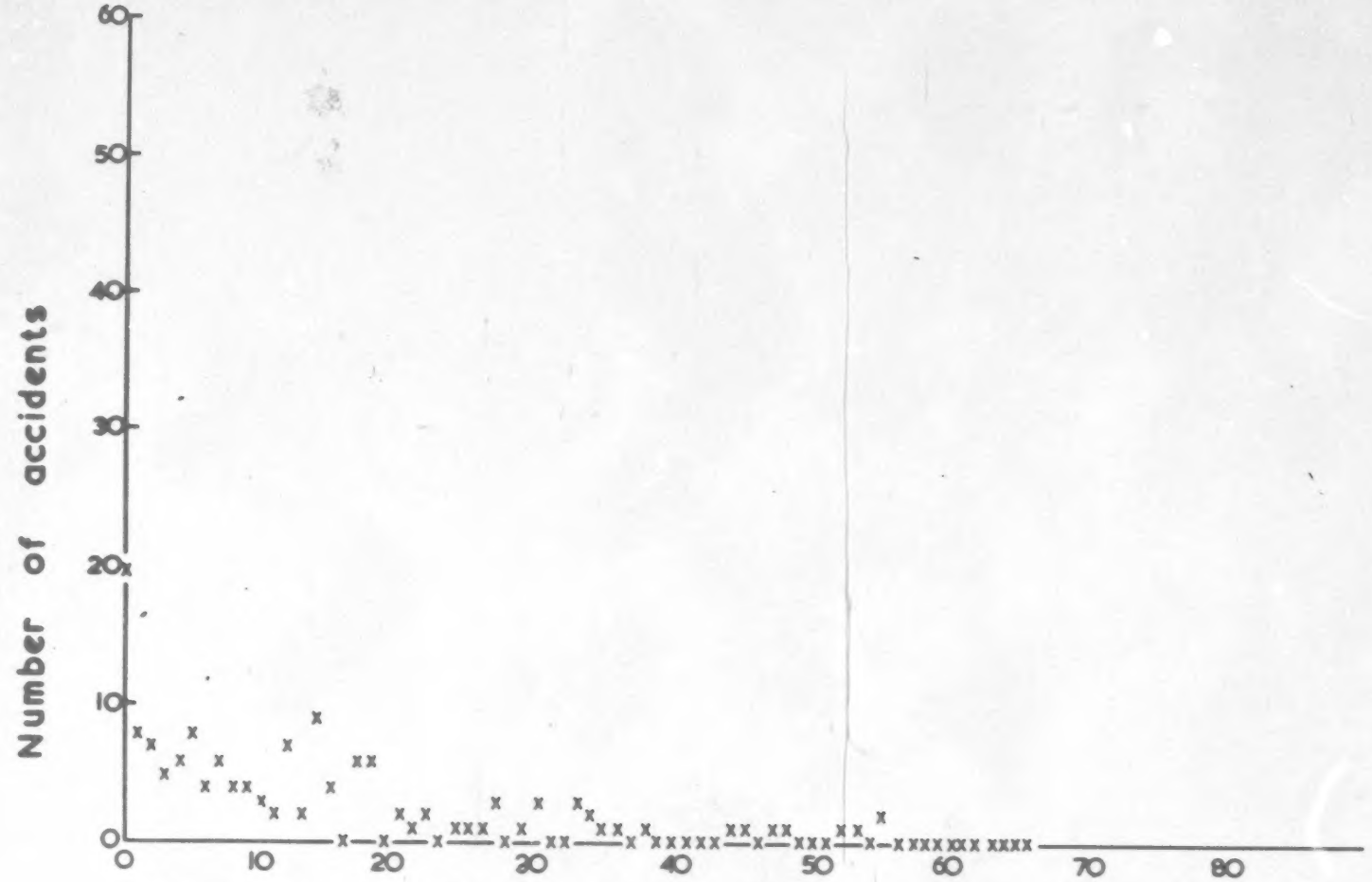
Months		Boys						Girls				
		Pre	Con	Full	Sim	Total		Pre	Con	Full	Sim	Total
0 - 6	accidents	22	63	32	4	121		4	30	19	3	58
	months	559	1440	1267	84	3350		144	957	821	30	1952
	rate	.0394	.0438	.0253	.0482	.0361		.0417	.0313	.0231	.1000	.0297
7 -12	accidents	22	29	31	2	84		2	10	11	1	24
	months	532	1379	1231	84	3226		130	943	785	85	1943
	rate	.0414	.0210	.0252	.0238	.0260		.0154	.0106	.0140	.0118	.0124
13 -18	accidents	12	18	30	0	60		0	20	7	0	27
	months	508	1249	1204	82	3043		123	894	725	84	1826
	rate	.0236	.0144	.0249	.0000	.0197		.0000	.0224	.0097	.0000	.0148
19 -24	accidents	7	22	16	1	46		0	3	2	1	6
	months	487	1149	1149	78	2843		118	812	691	83	1704
	rate	.0144	.0191	.0139	.0128	.0161		.0000	.0037	.0014	.0120	.0035
25 -30	accidents	7	17	18	2	44		0	5	3	1	9
	months	450	1039	1113	77	2679		114	716	648	75	1553
	rate	.0156	.0164	.0162	.0260	.0164		.0000	.0070	.0048	.0133	.0058
31 -36	accidents	9	9	14	1	33		0	5	2	0	7
	months	355	872	1006	67	2300		100	530	564	67	1261
	rate	.0254	.0103	.0139	.0149	.0143		.0000	.0094	.0035	.0000	.0056
37 -42	accidents	8	15	7	3	33		1	1	1	0	3
	months	385	689	601	65	1740		89	384	364	43	880
	rate	.0208	.0218	.0116	.0462	.0190		.0112	.0026	.0027	.0000	.0034
43 -48	accidents	8	4	1	0	13		0	4	2	0	6
	months	332	499	224	36	1091		72	302	143	33	550
	rate	.0241	.0080	.0045	.0000	.0119		.0000	.0132	.0140	.0000	.0018
49 -54	accidents	1	3	0	0	4		0	2	0	0	2
	months	206	290	23	11	1130		47	182	6	6	241
	rate	.0044	.0103	.0000	.0000	.0075		.0000	.0110	.0000	.0000	.0083
55 -60	accidents	3	3	0	0	6		0	0	0	0	0
	months	95	167	0	0	262		21	50	0	0	71
	rate	.0316	.0180	.0000	.0000	.0229		.0000	.0000	.0000	.0000	.0000
61 -66	accidents	0	1	0	0	1		0	0	0	0	0
	months	36	58	0	0	94		19	1	0	0	20
	rate	.0000	.0172	.0000	.0000	.0106		.0000	.0000	.0000	.0000	.0000
67 -72	accidents	0	0	0	0	0						
	months	9	31	0	0	40						
	rate	.0000	.0000	.0000	.0000	.0000						
73-78	accidents	0	0	0	0	0						
	months	0	6	0	0	6						
	rate	.0000	.0000	.0000	.0000	.0000						



Experience— length of time in months since passing test.

FREQUENCY DISTRIBUTION OF THE MALE DRIVERS ACCIDENTS & EXPERIENCE.

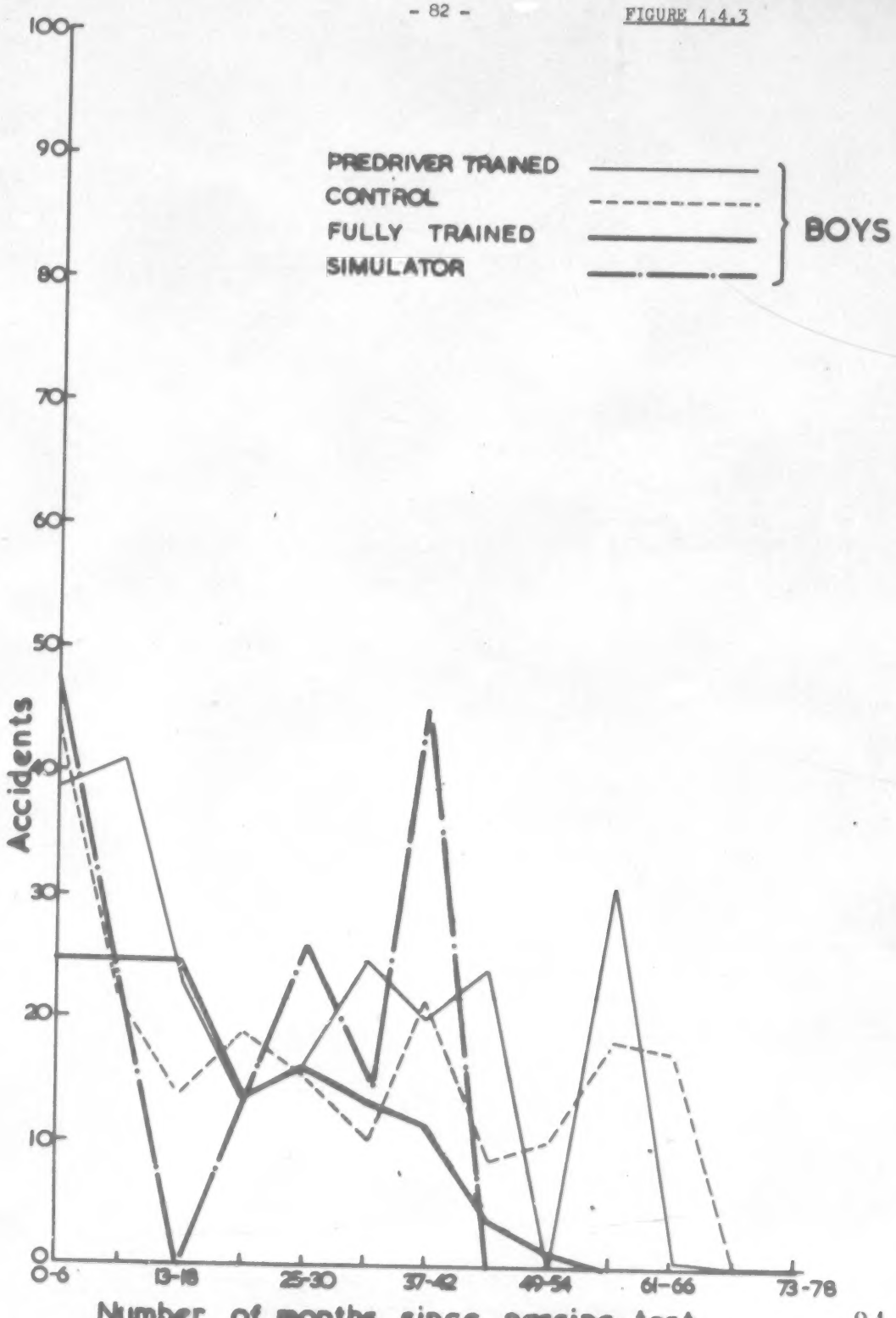
FIGURE 4.4.1



FREQUENCY DISTRIBUTION OF FEMALE DRIVER'S ACCIDENTS & EXPERIENCE.

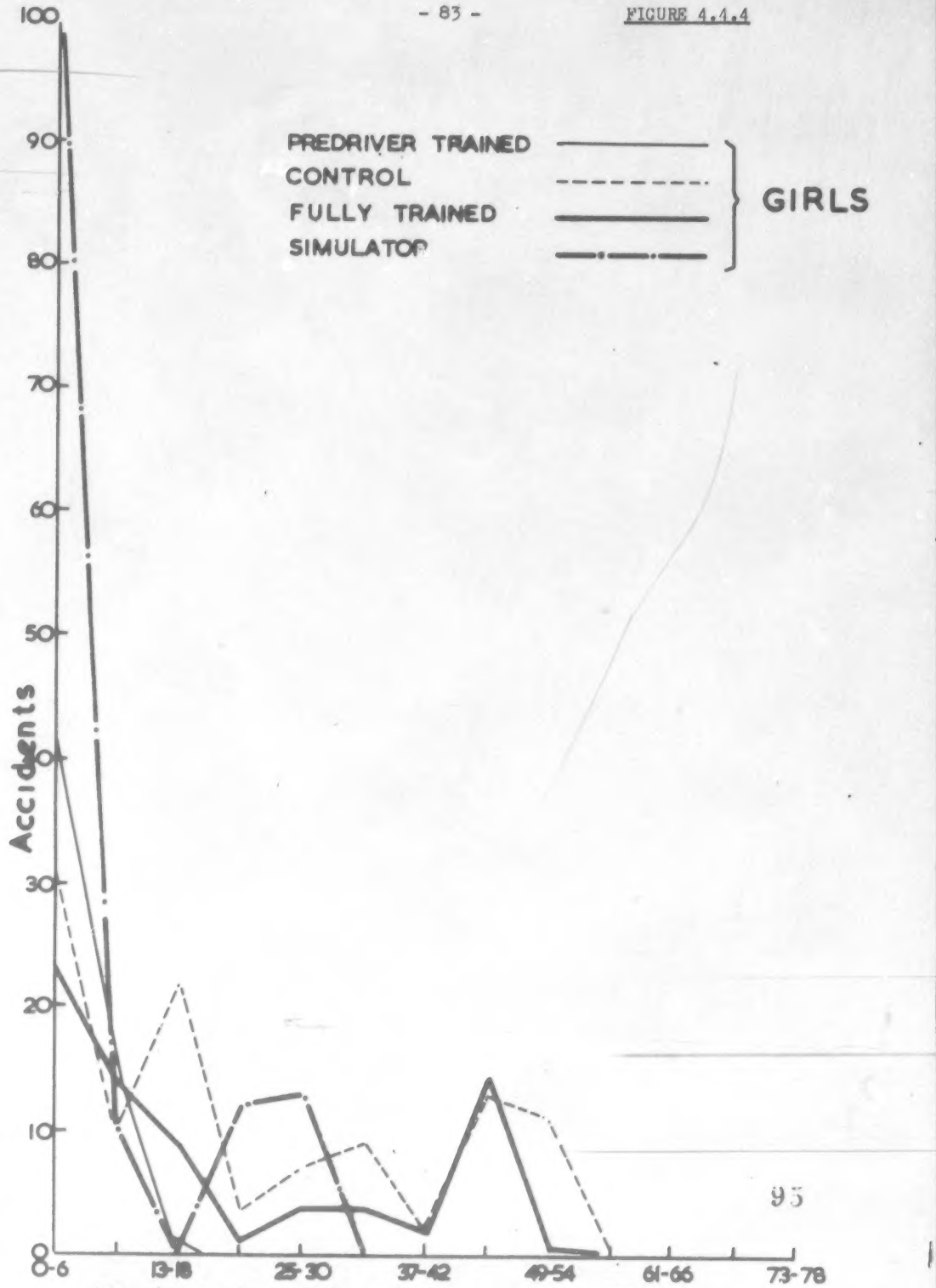
FIGURE 4.4.2

FIGURE 4.4.3



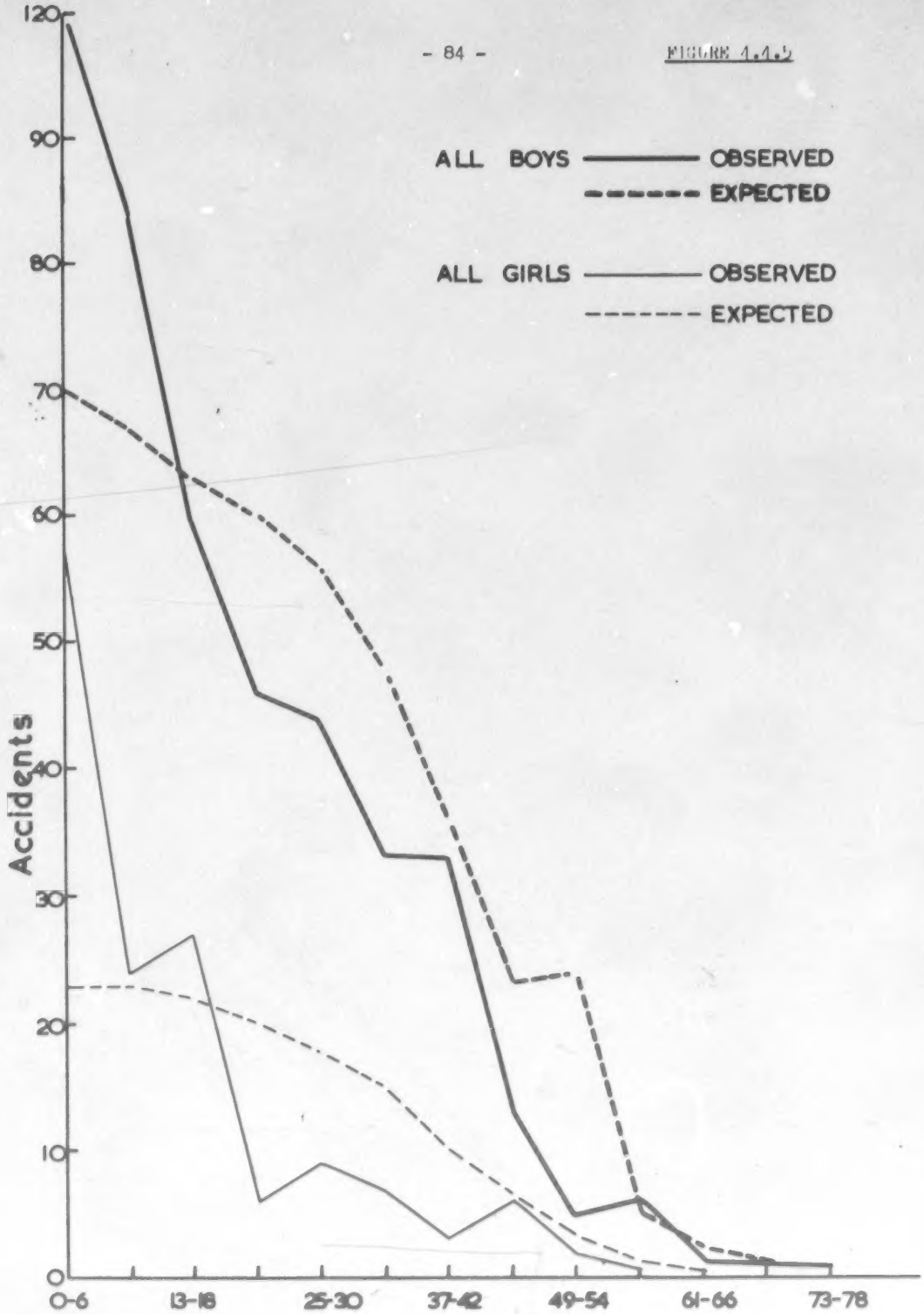
ACCIDENT RATES PER SIX MONTHS OF DRIVING EXPERIENCE

FIGURE 4.4.4



ACCIDENT RATE PER SIX MONTHS OF DRIVING EXPERIENCE

FIGURE 4.4.5



OBSERVED AND EXPECTED FREQUENCY DISTRIBUTION OF ACCIDENTS PER SIX MONTHS OF DRIVING EXPERIENCE

4.5 The relationship between a course of driver education and the age when accidents most frequently occurred

Since age is related to accident frequency and a course of driver education did, in the short term, but not the long term, result in a larger number of people qualifying as drivers than would otherwise have done, it is possible that accident rates per 5,000 mile ranges for each of the groups may be obscuring the effects of age and that when age is controlled, differences between the groups may emerge. The effect of age on accidents was therefore examined. A previous analysis of the interrelationship and determinants of driving practices (Shaoul, 1975) showed that age determined to a certain extent the length of time they had been driving, their employment status (whether they were still students or were now in full-time employment), the purpose of driving and their total mileage.

Figures 4.5.1 and 4.5.2 show the frequency distribution of the age when accidents occurred for the boys' and girls' samples respectively. It can be seen that in both cases, the frequency of accidents rises until about nineteen and a half years of age for the boys and eighteen and a half for the girls and then declines. It is not clear whether this represents an increase and decrease in risk since it is not corrected for the number of drivers. The girls had fewer accidents than the boys.

Table 4.5.1 shows the average age of the drivers in each group who had had an accident when the accident occurred. It will be seen that in both the boys' and girls' samples, the fully trained groups were slightly younger when they were involved in an accident. There were no consistent differences between the boys and girls with respect to their age when the accident occurred. By comparing the average age when the accident occurred with the previous analysis it can be seen that apart from the small group of pre-driver trained girls, this had increased in all cases by about 12-13 months.

Table 4.5.2 shows the accident rates per 6 months of age after the seventeenth birthday. This rate is the average accident rate in every six month age range, adjusted for the number of drivers who have driven at that age. This is rather more complicated since everyone started to drive at a different age and were also in different age groups when they left the project, i.e. there was no uniform increase in the number of drivers as the age increased but, due to the slightly different age composition of the groups, the numbers in each age group increased and then declined. In each of the groups, the accident rate is highest for the youngest age group, declines rapidly for the next 2 age groups and declines fairly slowly after that. After the age of 21 years, the rate tends to rise again but this seems more likely to be reflecting an inadequate sample size than representing a meaningful increase in the accident rate for the population as a whole.

The fully trained groups have lower rates per driver in the youngest age groups than any of the other groups. This seems likely to be due to the fact that fewer of them drove very much rather than to maturation processes as such. Even in the other age groups, this difference, although not so marked, is apparent. Again, this seems likely to reflect the lower mileage per month of driving experience. Figures 4.5.3 and 4.5.4 show these accident rates for the boys' and girls' groups respectively in a graphical form.

When the girls' and boys' rates of accident involvement per month of age are compared, it can be seen that for the first year after the minimum licensing age, they are very similar, but after that the girls' accident rates per month of age are substantially lower. While it is difficult to interpret these findings, it seems likely that these lower rates reflect their lower mileage.

Table 4.5.1 Average age when the accident occurred

	Pre-driver	Control	Full	Simulator	Total
Boys	19yr 8m	19yr 4m	19yr 0m	19yr 9m	19 yr 4m
Girls	20yr 3m	19yr 6m	18yr 10m	19yr 0m	19yr 4m

Table 4.5.2 : Accident rate per driver for each six months of age after 17th birthday.

Months		Boys					Girls				
		Pre	Con	Full	Sim	Total	Pre	Con	Full	Sim	Total
0 - 6	accidents	9	19	14	0	42	0	4	6	0	10
	drivers	13	25	49	5	92	0	4	16	0	24
	rate	.6923	.7600	.2857	.0000	.4565	.0000	1.000	.3750	.0000	.4167
7 - 12	accidents	11	25	20	1	57	2	9	11	2	24
	drivers	42	104	154	10	310	6	56	60	7	129
	rate	.2619	.2404	.1299	.1000	.1839	.3333	.1607	.1833	.2857	.1360
13 - 18	accidents	13	18	22	0	53	2	7	8	3	20
	drivers	61	139	177	11	388	10	94	97	11	212
	rate	.2131	.1295	.1243	.0000	.1366	.2000	.0745	.0825	.2727	.0943
19 - 24	accidents	8	19	22	2	57	0	11	7	1	19
	drivers	66	162	187	13	428	11	116	105	13	245
	rate	.1212	.1173	.1176	.1538	.1332	.0000	.0948	.0095	.0769	.0776
25 - 30	accidents	12	23	22	2	59	0	8	2	0	10
	drivers	69	181	192	13	455	16	133	113	14	276
	rate	.1739	.1271	.1146	.1538	.1297	.0000	.0602	.0177	.0000	.0362
31 - 36	accidents	6	16	22	2	46	0	11	4	0	15
	drivers	75	201	200	14	490	16	143	117	14	290
	rate	.0800	.0796	.1100	.1429	.0939	.0000	.0769	.0342	.0000	.0517
37 - 42	accidents	9	19	11	4	43	0	11	3	0	14
	drivers	78	215	197	14	504	17	143	126	13	299
	rate	.1154	.0884	.0558	.2857	.0853	.0000	.0769	.0238	.0000	.0468
43 - 48	accidents	8	22	12	2	44	2	6	4	0	12
	drivers	82	198	147	14	441	21	126	109	13	269
	rate	.0976	.1111	.0816	.1429	.0998	.0952	.0476	.0367	.0000	.0446
49 - 54	accidents	8	8	4	0	20	0	7	0	0	7
	drivers	80	156	87	8	331	22	94	64	11	191
	rate	.1000	.0513	.0460	.0000	.0604	.0000	.0745	.0000	.0000	.0366
55 - 60	accidents	5	8	0	0	13	0	4	0	0	4
	drivers	78	110	23	2	213	22	78	20	5	125
	rate	.0641	.0727	.0000	.0000	.0047	.0000	.0513	.0000	.0000	.0320
61 - 66	accidents	4	6	0	0	10	1	2	0	0	3
	drivers	50	58	2	0	110	18	42	1	0	61
	rate	.0073	.1034	.0000	.0000	.0909	.0556	.0476	.0600	.0000	.0492

		Boys						Girls				
		Pre	Con	Full	Sim	Total		Pre	Con	Full	Sim	Total
67 - 72	accidents	3	0	0	0	3		0	0	0	0	0
	drivers	21	20	2	0	43		7	10	0	0	17
	rate	.1429	.0000	.0000	.0000	.0698		.0000	.0000	.0000	.0000	.0000
73 - 78	accidents	2	0	0	0	2		2	0	0	0	2
	drivers	6	10	1	0	17		4	0	0	0	4
	rate	.3333	.0000	.0000	.0000	.1176		.5000	.0000	.0000	.0000	.5000
79 - 84	accidents	0	0	0	0	0		0	0	0	0	0
	drivers	1	3	0	0	4		1	0	0	0	1
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000

FIGURE 4.5.1 FREQUENCY DISTRIBUTION OF THE MALE DRIVERS' ACCIDENTS AND THE AGE WHEN THEY OCCURRED

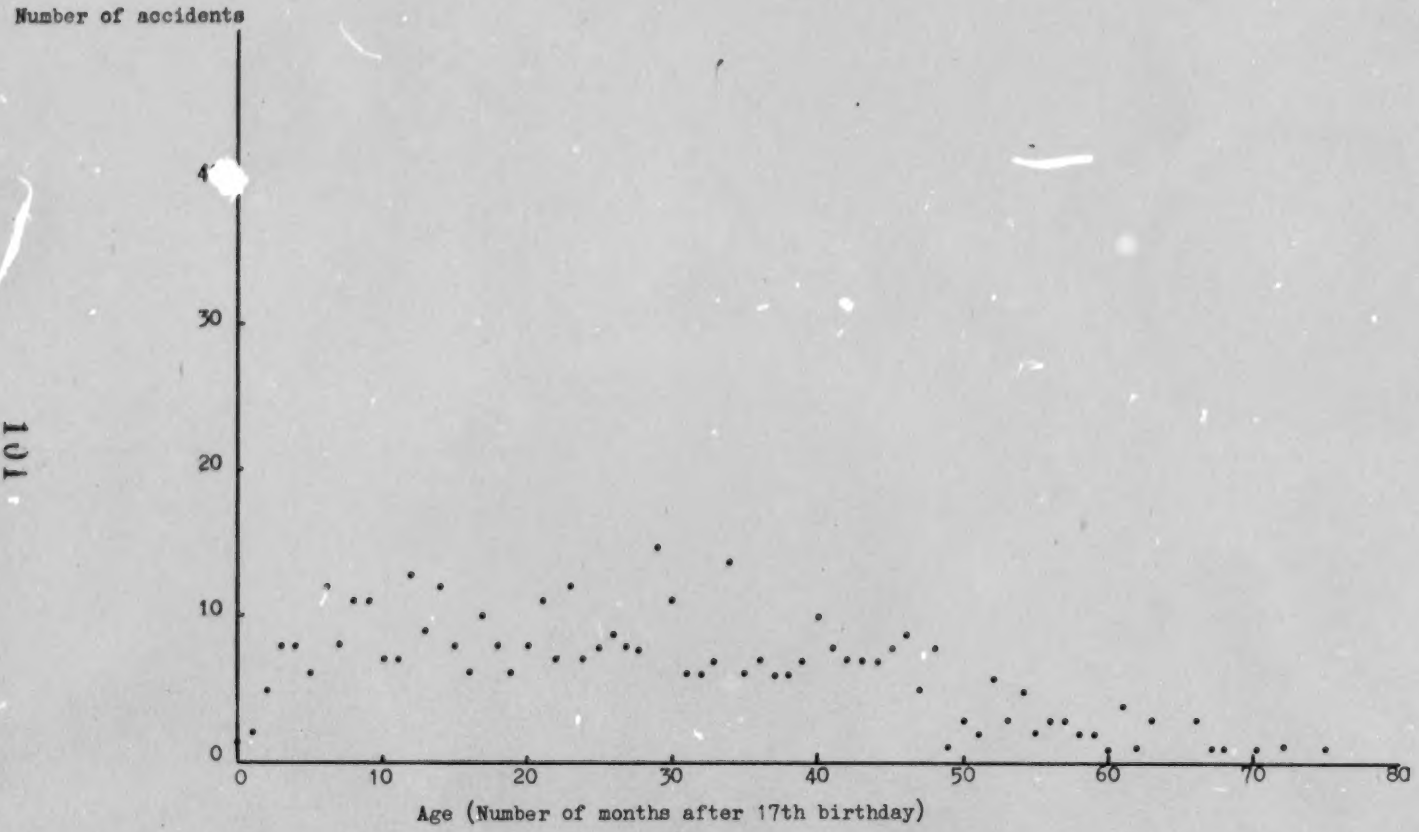


FIGURE 4.5.2 FREQUENCY DISTRIBUTION OF THE FEMALE DRIVERS' ACCIDENTS AND THE AGE WHEN THEY OCCURRED

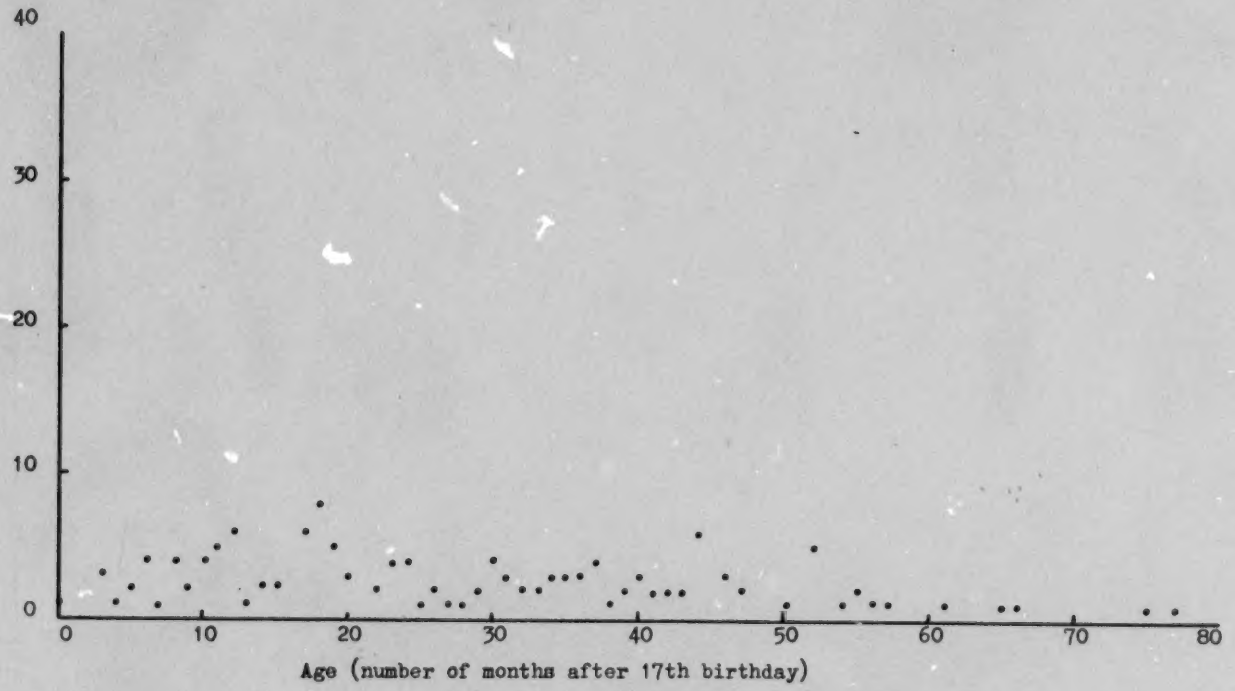


FIGURE 4.5.3 ACCIDENT RATES PER DRIVER PER 6 MONTHS OF AGE SINCE 17th BIRTHDAY (BOYS)

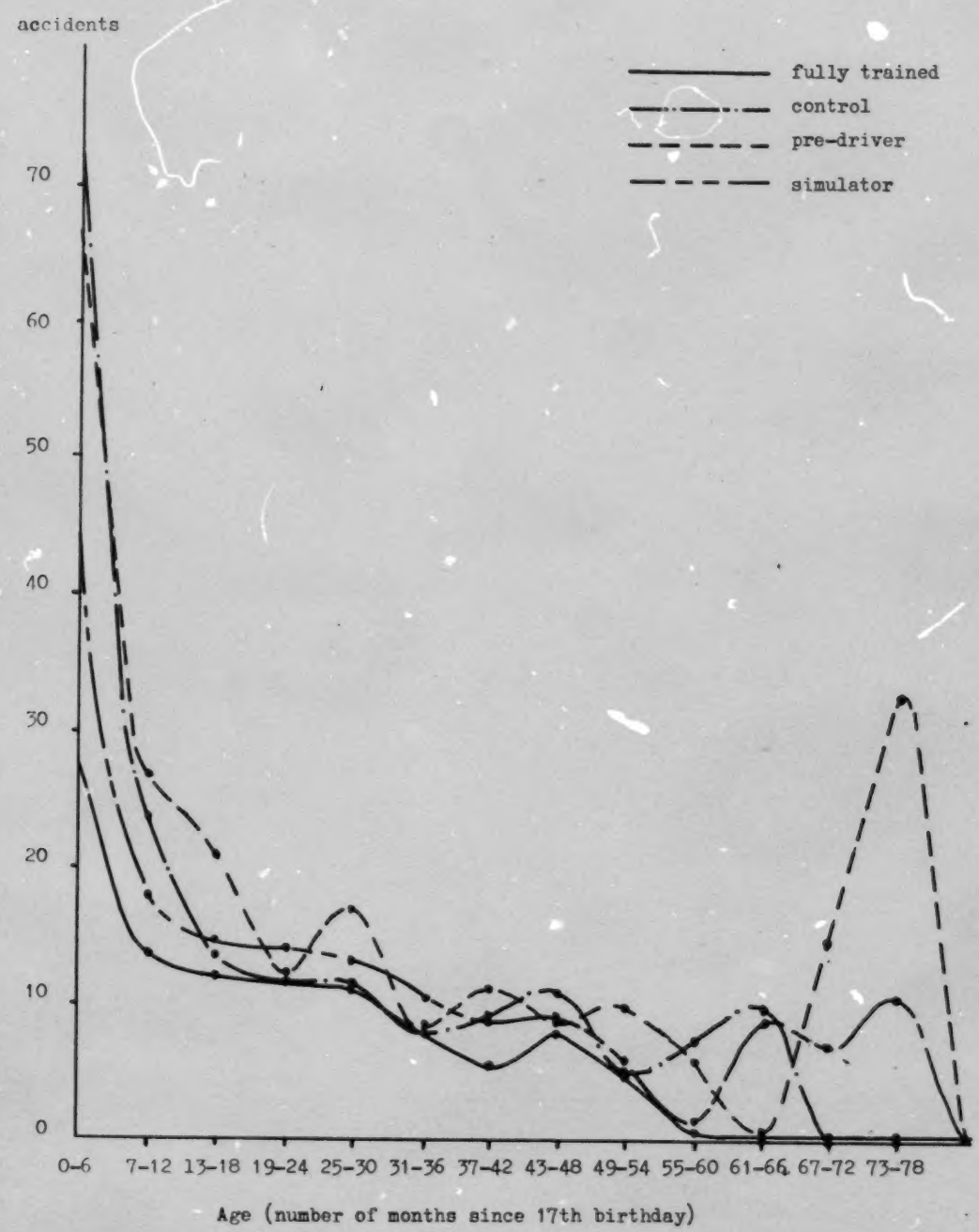


FIGURE 4.2.4 ACCIDENT RATES PER DRIVER PER 6 MONTHS OF AGE SINCE 17TH BIRTHDAY (FEMALE)

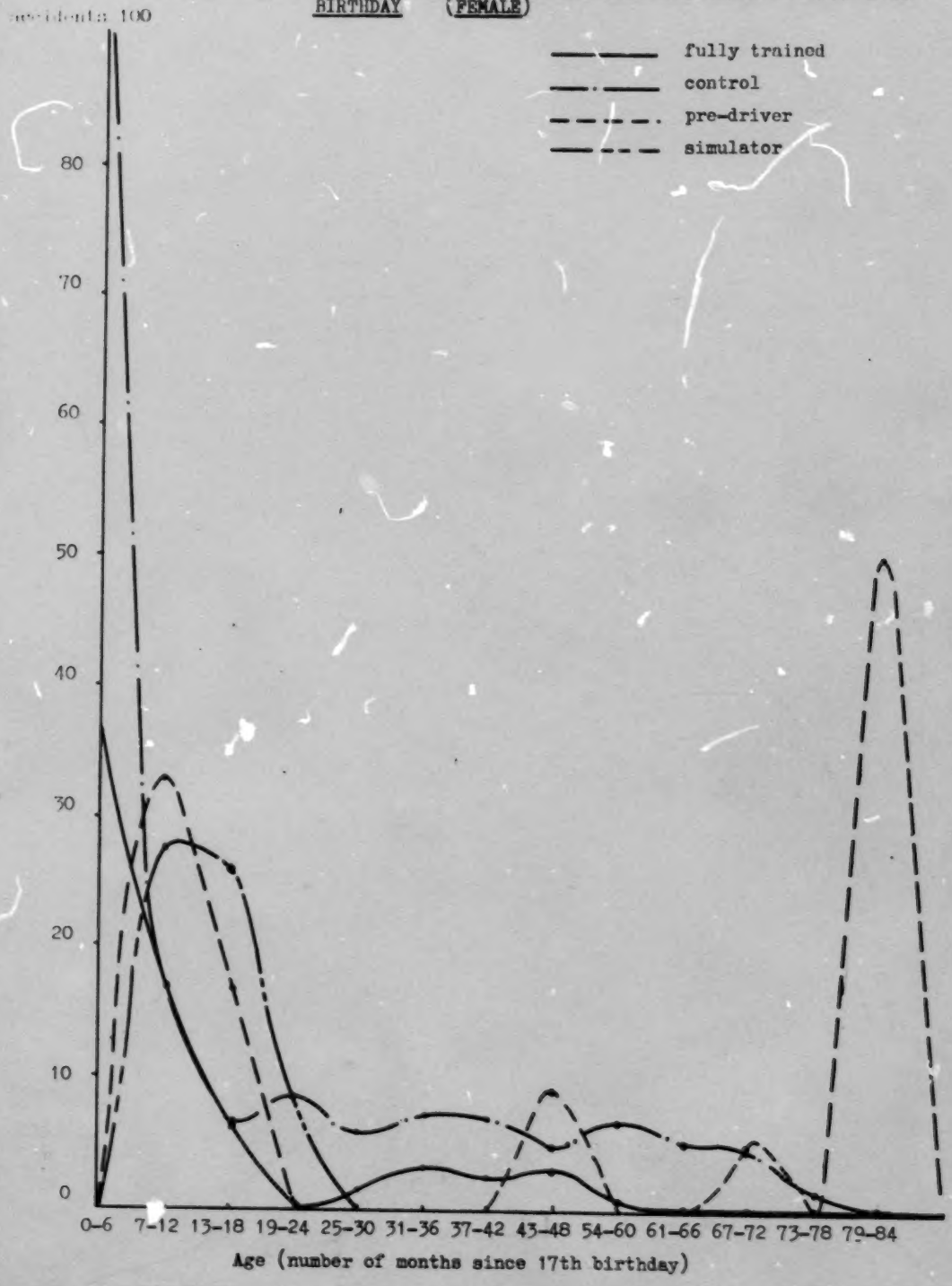
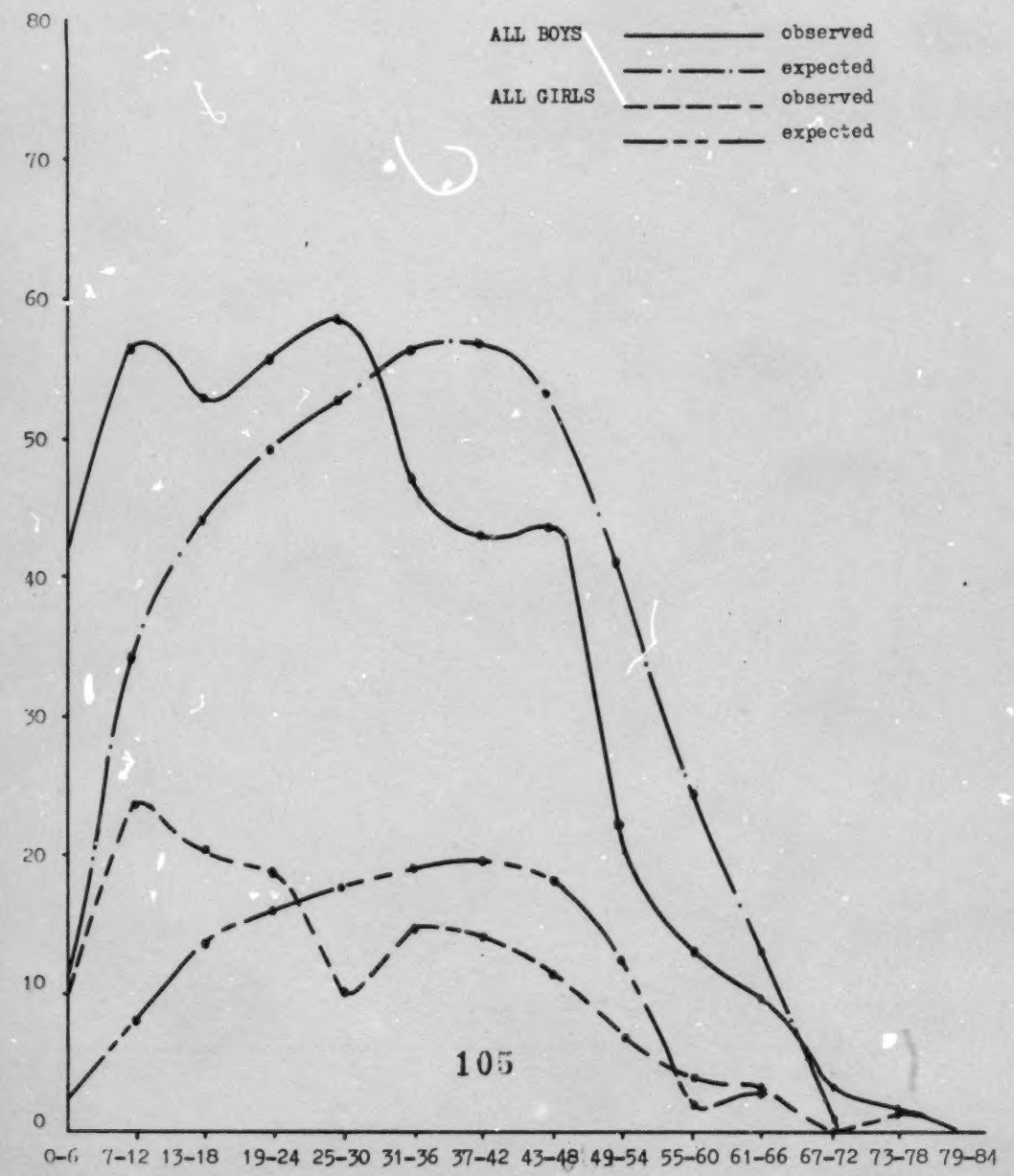


FIGURE 4.5.2 OBSERVED AND EXPECTED FREQUENCY DISTRIBUTION OF ACCIDENTS PER DRIVER PER SIX MONTHS OF AGE SINCE 17TH BIRTHDAY



The trends were tested for significance and were found to be significant at the 5% level. Thus the distribution of accidents was not found to be independent of age but age related and this relationship was an inverse one. Figure 4.5.5 shows the observed and expected frequency distribution of accidents per driver per 6 months of age since 17th birthday for the boys' and girls' sample in a graphical form. However, while it is possible to achieve statistical significance, its substantive significance is less certain. Age is a summary variable with little explanatory power of its own, particularly with respect to a sample which is, from a physiological point of view, an adult one and very homogeneous. While it may be assumed that it is the different behavioural patterns associated with the different age groups which result in different accident rates, it is not clear which aspects of behaviour are involved, e.g. the extent of interaction with the car, driving skill as such etc. Since age is known to be related to total mileage, and other factors, it can be assumed that in part it is measuring skill, type of exposure to risk, particularly night driving since age was associated with employment status which was also associated with the purpose of driving and that in turn was associated with day/night driving.

When the earlier analysis of the data as it related to the age of accident involvement (Shaoul, 1972) was carried out, the downward trend was also apparent. But in addition a second upward trend was noted. It can be seen from the present data, that the second upward trend did not represent anything of substance but was due to the fact that the sample was very small. Therefore it seems likely that the slight tendency for the rate to rise again, as shown in Table 4.5.2, at about 23 years of age is also due to sampling inadequacies.

To conclude, while the driver educated students had fewer accidents in the first year after the minimum licensing age than the other groups, there is no evidence to suggest that the nature of the relationship is a direct causal one. It seems more likely to be explained by a third variable known to vary with the groups, namely mileage per month of experience. Thus the effect is a somewhat illusory one.

4.6 The relationship between age, experience and mileage and accident involvement

An attempt was made to isolate the effects of increasing age and experience. The two dimensional diagrams shown in Tables 4.6.1 and 4.6.2 have age along one axis and experience along the other and show the accident rates per driver within each six month period for all the boys and the girls respectively. No accident rates are shown in the upper triangle since the earliest one could have passed the test is at seventeen years of age and it is therefore impossible to have been a full licence holder for more months than the number of months after the 17th birthday. Each diagonal, starting from the left hand side, shows the progression of the students' accident rates per driver per 6 months, from the time when they passed the test, during successive six month intervals. Generally, the rates decline as age and experience increases.

Each column shows the effect of age, when the level of experience is held constant. When any one column is examined, it can be seen that there is some variation between the rates but no overall trend emerges. The highest rates in any one column are denoted by 'A' and it will be observed that the total number of 'A's' is very low and very similar for the 17-21 year olds and slightly more likely to be in the age range 21-22 where the sample sizes are very small. Thus it would appear that age per se, (as distinct from length of time they have been driving) is not an important determinant of accidents per driver. It would also appear (by comparing the diagonals) that the age at which one learns to drive (for this group of drivers who are fairly

homogeneous with respect to age) has little effect on accident frequency.

Each row shows the effect of experience when age is kept constant. When the rows are examined, it can be seen that the rates tend to decline slightly. The highest rates in any one row are denoted by 'E' and it will be seen that this is usually to be found in the first year of learning to drive, irrespective of the age of learning to drive. It would seem that, on the whole, experience (as measured by the number of months since passing the test) is associated with more consistent variation in accident rates than age, in young drivers. The data presented do not permit any firm conclusions to be drawn since the less important measure of experience has been used - namely that of time rather than distance. (The nature of the mileage data, because it does not increase at a constant rate for all drivers, does not permit a similar analysis to be carried out for age and mileage or experience and mileage).

It is interesting that the results are broadly similar for both the boys and the girls whose accident involvement appeared to be very dissimilar. This would suggest that the major determinant of the variation in accident involvement is experience. The girls, driving far less than the boys, had acquired far less driving experience.

An attempt was made to assess the contribution of each of the three variables, age, experience and total mileage, to accident involvement. The information obtained at each survey was used, concerning each individual member of the sample. That is, several observations were made of the same sample. These observations are not of course independent, since at each survey point, age, experience and mileage has increased. An analysis of the intercorrelation data showed that age was correlated very closely with experience (about 0.85 for most of the groups), and that experience was correlated more closely with mileage (about 0.50) than age was. Of the three variables, mileage was correlated more closely with the number of accidents. Although the multiple R was found to be significant at the 5% level, the percentage of variation explained, about 17%, is of little practical value. Multiple regression, after transformation of the data, produced results of even lower predictive validity. Thus, while there is some relationship between age, experience, mileage and accidents, it is not very high. Total mileage was found to be the most important variable in predicting accidents. The results were broadly similar for all the groups of boys and girls.

Correlational analysis was carried out for all the data collected at the last survey prior to October 1974. No significant correlations with accidents or traffic offences were observed for any of the boys' groups or for the boys' sample as a whole. In the girls' sample, accidents occurring in the seven months prior to being contacted in 1974 were found to be significantly correlated with mileage in the previous seven days and average weekly mileage. However this relationship was not very high.

Thus, all three methods of determining the contribution made to accident involvement by age, experience and mileage, point to the greater importance of total mileage rather than age and length of driving time. This would tend to indicate that the ability to avoid becoming involved in accidents is acquired by practice rather than that accident involvement is determined by age and the life style that goes with the different age range. However, it must be pointed out, that this is a very homogeneous sample with respect to age, type of employment etc., and consequently the effects of these factors may be more apparent in a more heterogeneous sample. In addition it is impossible to say which aspects of driving behaviour are being modified by practice, thereby resulting in fewer accidents.

TABLE 4.6.1 AGE, EXPERIENCE AND ACCIDENT INVOLVEMENT AMONG ALL THE BOYS

Months of age after 17th birthday	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	61-66	67-72	Total number of A's
0-6	A .49												1
7-12	B .18	B .18											0
13-18	.14	B .15	.10										0
19-24	B .18	.11	.13	.08									0
25-30	.11	B .21	A .14	.11	.15								1
31-36	B .19	.14	.13	.04	.08	.09							0
37-42	B .26	.14	.0	.05	.05	.09	.08						0
43-48	.00	B .22	.13	A .20	.14	.06	.12	.02					1
49-54	.08	.0	B .11	B .11	.06	.04	.06	.06	.02				0
55-60	.00	.18	.08	AB .20	.00	.00	.10	.05	.06	.08			1
61-66	.00	.00	.00	.00	A .17	.00	AB .25	A .10	.07	A .14	A .17		4
67-72	.00	AB 1.00	.00	.00	.00	A .50	.00	.00	.00	.10	.00	.00	2
Total number of B's	4	5	1	2	0	0	1	0	0	0	0	0	

A denotes the most dangerous age group at each level of experience
B denotes the most dangerous experience level at each age.

TABLE 4.6.2 AGE, EXPERIENCE AND ACCIDENT INVOLVEMENT AMONG ALL THE GIRLS

Months of age after 17th birthday	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	61-66	67-72	Total number of A's
0-6	A 2.75												1
7-12	.12	AB 2.25											1
13-18	.08	.01	AB 1.25										1
19-24	.18	.04	.07	AB .25									1
25-30	B .10	.03	.07	.01	.00								0
31-36	B .43	.03	.15	.02	.02	.00							0
37-42	.05	.00	.03	B .06	.05	A .05	A .05						2
43-48	B .19	.06	.00	.00	A .10	.03	.01	A .15					2
49-54	.00	B .19	.08	.00	.00	.00	.00	.08	.00				0
55-60	B .33	.00	.20	.00	.00	.00	.00	.00	.03	.00			0
61-66	.00	.00	B .50	.00	.00	.00	.00	.00	A .07	.00	.00		1
Total number of B's	4	2	2	2	0	0	0	0	0	0	0		

A denotes the most dangerous age group at each level of experience
B denotes the most dangerous experience level at each age

4.7 The relationship between driver education and the severity of the accident

So far, accidents have been treated as homogeneous events and no consideration has been given to the outcomes, i.e. the severity of the accident. Accidents have been defined earlier as outcomes of a collision between two objects in the transport system which result in damage to property and/or injury to a road user. They may be seen as incidental to the transport system and are only one of many side effects of this system which may be studied. There are other disadvantages in the road transport system such as noise, pollution, ill-health caused by driving etc. which are incidental to this system. Accidents belong therefore to a wider class of side effects, namely collisions. Various factors such as energy absorbing bumpers, seat belt usage, efficient ambulance services, an unoccupied vehicle, may prevent a collision from being classified as an accident since they reduce the consequences of such a collision. Since, on the one hand, this study is an attempt to monitor the growth of knowledge as reflected in the young drivers' activities on the road, and on the other hand the assumption is made that unsafe practices on the part of the road user will lead to accidents these considerations lead to the use of collisions rather than just accidents as criteria for safe practices. Even this criterion cannot be viewed as a representative sample of safe practices in a study which is concerned with the behaviour and activities of a driver on the road, but rather as an intermediate criterion for the ultimate criterion - namely safe driving.

However, when driver education is considered as an accident countermeasure, it is its role in preventing injury and extensive damage accidents which is of prime importance. In this study so far, all accidents have been considered, for several reasons. Firstly because collisions are nearer to the ultimate criterion of safe practices and secondly because to restrict the study to injury accidents would only reduce the scope of the enquiry since very few injury accidents could be expected in a sample of this size. The subsequent analysis will attempt to isolate the effect of training on the outcome of the accident.

4.7.1 Injury accidents There are at least two aspects to the concept of accident severity, namely injury and cost. The severity of the injury is defined in the accident description form (Appendix 3.3.2). The main criterion used for judging the severity of the injury sustained was the length of time the injured person stayed off work. This is difficult because since many were students, they did not go to work. The injury was therefore defined according to the amount of time they would have taken off, if they had been working. Another difficulty is that a relatively minor accident for one person may involve a longer absence from work for another person because of the nature of the job. These difficulties should therefore be considered when interpreting the data.

Table 4.7.1 shows the number of accidents in each group which resulted in any injury to a road user. It can be seen that a smaller proportion of the fully trained boys' accidents resulted in any injury. Their injury per driver rate was also the lowest, as was the injury rate for the group as a whole. When the injury accident rate per mile is considered, the untrained boys had the most dangerous record. The differences between all these four rates were significant at the 5% level.

The converse picture is to be observed for the girls' injury accident rates. For all the rates, the fully trained girls have a more dangerous record than the untrained girls. The pre-driver trained girls have the best record. However, none of these differences are significant.

When the boys and girls are compared it can be seen that a slightly smaller percentage of the girls' accidents result in any injury, the girls had a lower injury accident rate per driver but a higher injury accident rate per mile than the boys.

In both the boys' and the girls' sample, the pre-driver trained groups had a lower average injury accident rate per mile than any of the other groups, including the fully trained groups. The main difference between the two types of course was the number of hours of driving instruction. Because the fully trained group received 15 hours of free instruction, many more of this group became drivers. Having acquired a licence, many of them put it to some use and drove a little. Hence the slightly higher injury accident rate per mile. The pre-driver trained group who had received the benefit of formal classroom instruction and a little driving instruction learned to drive of their own initiative. Because they were more motivated to drive, they drove more frequently and regularly than the fully trained group, thereby becoming more experienced and proficient drivers sooner than the fully trained group. This result is particularly interesting in view of their inferior performance in the follow up knowledge test.

However, it is difficult to establish the nature of the relationship between training and the injury accident rate (rather than simply noting its existence) without looking more closely at the relationship between mileage and injury accidents. If this rate is also found to be non-linear, then the average rate noted earlier may be obscuring the true nature of the relationships between training, injury accidents and mileage. Similarly it is difficult to interpret the nature of the slight differences between the boys' and girls' injury accident rates without a closer investigation of the role of experience. The analysis in Section 4.3 suggests that the lower total mileage may account for these differences.

However, until this analysis is carried out, it must simply be stated that there is a relationship between training and injury accidents for the boys, but not for the girls. The nature of this relationship cannot yet be established.

4.7.2 Serious damage accidents The second aspect of severity in accidents is the cost of repairing the vehicle involved. For the purpose of comparing the severity of accidents, only those accidents involving more than £50 worth of damage are considered. There are several difficulties in estimating the cost of repair of all the vehicles involved in the accident - particularly the "other" vehicles involved. When large scale repairs were involved these were frequently paid for by the insurance companies concerned, hence the respondent would not know the cost. For this reason the categories of cost of repair were broadly defined so that it would be possible for the respondent to estimate the cost. Another problem is that a relatively small bump may be quite costly to repair and it may therefore not be repaired. In other cases, the students said they repaired the car themselves because it was very much cheaper than having it repaired at a garage. Since these accidents have taken place over a six year period with rising prices, it cannot even be assumed that a £50 damage accident represents similar degrees of accident severity over time. Those accidents where the cost was not known had to be excluded from the analysis. This is a limitation since it is not known whether the percentage of "don't knows" per serious accident is similar for all the groups. These accidents are classified on the basis of cost of repair only and are therefore likely to include the injury accidents, although not necessarily. If, for example, a pedestrian was injured while crossing the road, the damage to the car may have been negligible. Therefore this injury accident would not be included in this analysis.

Table 4.7.2 shows the number of serious damage accidents for each of the

Table 4.7.1 : Injury Accidents

	Pre-driver	Control	Full	Simulator	Total	x^2
Boys						
Number of accidents resulting in injury	15	22	10	4	51	
% accidents resulting in injury	16%	12%	7%	31%	11%	$p < 0.05$
Injury accident rate per driver	.16	.09	.05	.29	.09	$p < 0.05$
Injury accident rate per total in the group	.09	.05	.03	.16	.05	$p < 0.05$
Injury accident rate per mile	.001	.004	.003	.011	.004	$p < 0.05$
Injury accident rate per month of driving experience	.0036	.0024	.0012	.0068	.0023	$p < 0.05$
Girls						
Number of accidents resulting in injury	0	7	5	0	12	
% accidents resulting in injury	0%	9%	11%	0%	9%	$p > 0.05$
Injury accident rate per driver	.000	.04	.04	.00	.03	$p > 0.05$
Injury accident rate per total in the group	.000	.014	.016	.000	.013	$p > 0.05$
Injury accident rate per mile	.000	.005	.008	.000	.005	$p > 0.05$
Injury accident rate per month of driving experience	.0000	.0012	.0010	.0000	.0010	$p > 0.05$

Table 4.7.2 : Number of accidents where the cost of repairing all the vehicles involved was greater than £50.00

	Pre-driver	Control	Full	Simulator	Total	x^2
Boys						
Number of serious damage accidents	40	52	54	5	151	
% total accidents	41%	28%	36%	38%	34%	$p > 0.05$
Serious damage accident rate per driver	.42	.21	.25	.33	.26	$p < 0.05$
Serious damage accident rate per total group	.24	.13	.16	.20	.16	$p < 0.05$
Serious damage accident rate per mile	.015	.010	.014	.014	.012	$p > 0.05$
Girls						
Number of serious damage accidents	3	18	9	0	30	
% total accidents	33%	23%	20%	0%	21%	$p > 0.05$
Serious damage accident rate per driver	.13	.10	.07	.00	.09	$p > 0.05$
Serious damage accident rate per total group	.04	.04	.03	.00	.03	$p > 0.05$
Serious damage accident rate per mile	.012	.012	.015	.000	.012	$p > 0.05$

groups in the sample. The fully trained boys had the largest number of accidents and the pre-driver trained boys had the smallest number. When this is expressed as the percentage of total accidents, fewer of the control boys' accidents resulted in serious damage than any of the other groups. The pre-driver trained group had the worst record. These differences were not significant at the 5% level. When the serious damage accident rates per driver in each group are compared, it can be seen that the control group has the safest record, closely followed by the fully trained boys and that the pre-driver boys have the worst record. These differences were statistically significant. Findings in earlier sections suggest that these differences are more likely to be due to the differences in the length of time they have been driving than to training. When the serious damage accident rate per total group (the rate often used in American research and which includes people who have not even passed their test), again the control group has the best record and the pre-driver trained group the worst. These differences were statistically significant at the 5% level. The serious damage accident rates per mile for each of the boys' groups are also listed in this table and again these rates place the groups in the same order of safety. However, this time, the differences are not significant, confirming the suggestion made earlier, that the frequency of serious damage accidents is related to mileage and experience rather than training.

Table 4.7.2 shows the various accident rates for the girls' groups. The pre-driver trained girls had the lowest number of accidents and the control girls the most. However, when the number of serious accidents is shown in relation to all their accidents, the same position does not hold. The pre-driver trained girls' accidents were more likely to result in costly repairs than the other groups, with fully trained girls' accidents being least likely to result in serious damage. These differences are not sufficiently large to achieve statistical significance. The serious damage accident rate per driver and for the total group also show the fully trained group to be the safest and the pre-driver trained the least safe. In both cases, the differences are not statistically significant. When however these groups are compared on the basis of serious accident rate per mile, the position is in fact reversed and the fully trained girls have a slightly larger number of accidents per mile than any of the other groups. Again, the differences are not large enough to achieve statistical significance.

Thus there is little evidence to suggest that after exposure to risk is controlled, that training has had any effect on the serious damage accidents for either the boys or girls. Such differences as emerged within the boys' sample could more plausibly be explained by differences in levels of experience than by training. There are fewer consistent and significant differences within the sample when serious damage accidents are compared than when injury accidents are compared. In addition, these two different aspects of accident severity place the boys' groups in a different relationship to each other with respect to safety.

4.7.3 Injury accidents and mileage, experience and age Since there was some doubt about the usefulness of the average injury accident rate per mile as a criterion for evaluating driver education, the accident rates per 5,000 miles for different ranges of mileage were calculated. These are shown in Table 4.7.3. This table therefore shows the average injury accident rate at different stages in a person's driving experience. From this, it can be seen that the boys' injury accident rate declines with every 5,000 miles covered. In other words, the risk declines with experience. The null hypothesis of equality between the accident rates per mile was tested. The injury accident rates per 5,000 miles travelled were not found to be the same for all ranges of mileage. In other words the average accident rate is not accurate enough in describing the accident rate for inexperienced drivers. Figure 4.7.1 shows the injury accident rate per 5,000 miles for each of the boys' groups. Figure 4.7.2 shows the injury accident rate for the boys' and girls' sample. The downward trend is noticeable.

Thus the significant difference observed in Table 4.7.1 with respect to the trained groups' superiority over the untrained group's average injury accident rate per mile travelled does not necessarily imply a causal relationship between training and a reduction in the injury accident rate per mile. Increased experience was also an important factor. Within each 5,000 mileage range, there was some variation between the boys' groups. This variation did not consistently favour one group rather than another. It is therefore difficult to come to any conclusion about the part played by driver education in reducing injury accidents. Although a statistically significant result was obtained, it does not seem to have any substantive meaning.

The average injury accident rate per 6 months of driving experience also showed that the fully trained boys' group had a significantly better record. Since this rate too had been found to be unsatisfactory as a criterion, the average accident rates per 6 months of driving experience for different ranges of experience, were calculated. Table 4.7.4 shows these rates. The variation between the different ranges of experience were not found to be statistically significant, i.e. no downward trend was apparent. Within any one 6 month experience range, the fully trained boys' group usually had a safer record. Thus it would appear that driver educated students had fewer injury accidents per month of driving experience.

Figure 4.7.3 shows, in graphical form, the injury accident rates per 6 months of driving experience for each of the boys' groups. It can be seen that the fully trained boys had the safest record and the pre-driver trained boys the least safe record. Figure 4.7.4 shows the injury accident rates for the boys' and girls' sample. Apart from the latter end of the boys' curve, where there is a marked peak, probably due to the small size of the sample, the curves are very flat, i.e. they do not decline with experience. The girls had a safer record than the boys. The likelihood of being involved in an injury accident was not dependent on the length of time the driver had held a licence, but it was dependent on his previous total mileage.

Likewise no discernable trend was apparent between injury accidents and age, i.e. injury accident involvement did not vary systematically with age (Table 4.7.5). When the boys' groups are compared within each age group, it can be seen that the pre-driver trained and fully trained groups have a safer record than the control group.

Figure 4.7.5 shows the injury accident rates for each of the boys' groups for each six months of age since the minimum licensing age, in a graphical form. The superiority of the trained group is immediately apparent. There is, for all the groups, a great deal of variation between the rates for each age range and no systematic trend is discernable. Figure 4.7.6 shows the injury accident rates per driver per 6 months of age after the 17th birthday for the boys' and girls' sample. By combining the boys' groups, it can be seen that there is less variation between the accident rates for the different age ranges, but nevertheless there is no apparent relationship between age and injury accidents. For the girls, however, a relationship between age and injury accidents is discernible, i.e. injury accidents decline with age.

To conclude therefore, this analysis has shown that the probability of being involved in an injury accident declined with driving practice, although not with the length of time they had been driving or increasing age. While the trained groups reported fewer injury accidents and a lower proportion of injury accidents, since the fully trained group had driven significantly fewer miles, it is not clear whether this difference in injury accidents represents an unwillingness on the part of those who received training to admit to injury accidents, a greater willingness to report trivial accidents, thereby lowering the ratio of injury to damage only accidents, to a lower mileage or to driver education as such. In any event, all the accident rates (e.g. average rate per driver, and average rate per mile) have been shown to present difficulties in interpretation.

TABLE 4.7.3 : INJURY ACCIDENT RATE PER 5000 MILE RANGE TRAVELLED

		Boys						Girls		
		Pre	Con	Full	Sim	All		Con	Full	All
0-5	injury accidents	0	11	2	1	14		4	4	8
	miles	414	925	832	58	2229		520	296	952
	rate	.0000	.0119	.0024	.0172	.0063		.0077	.0135	.0084
6-10	injury accidents	3	2	4	0	9		1	0	1
	miles	357	761	630	50	1848		312	129	536
	rate	.0084	.0026	.0063	.0000	.0049		.0032	.0000	.0019
11-15	injury accidents	1	3	2	3	9		0	0	0
	miles	305	636	506	45	1492		203	57	316
	rate	.0033	.0047	.0040	.0667	.0060		.0000	.0000	.0000
16-20	injury accidents	1	2	0	0	3		1	1	2
	miles	278	541	451	40	1310		137	32	210
	rate	.0036	.0037	.0000	.0000	.0023		.0073	.0313	.0095
21-25	injury accidents	3	1	2	0	6		0	0	0
	miles	244	455	325	30	1054		83	27	140
	rate	.0123	.0022	.0062	.0000	.0057		.0000	.0000	.0000
26-30	injury accidents	0	0	0	0	0		0	0	0
	miles	215	400	279	25	919		60	11	91
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000
31-35	injury accidents	2	1	0	0	3		0	0	0
	miles	165	313	200	25	703		40	5	60
	rate	.0121	.0032	.0000	.0000	.0043		.0000	.0000	.0000
36-40	injury accidents	0	0	0	0	0		1	0	1
	miles	137	274	159	25	595		25	5	40
	rate	.0000	.0000	.0000	.0000	.0000		.04	.0000	.0250
41-45	injury accidents	1	0	0	0	1		0	0	0
	miles	125	249	115	15	504		20	5	30
	rate	.0080	.0000	.0000	.0000	.0020		.0000	.0000	.0000
46-50	injury accidents	1	1	0	0	2		0	0	0
	miles	120	193	101	10	424		14	5	24
	rate	.0083	.0052	.0000	.0000	.0047		.0000	.0000	.0000
51-55	injury accidents	0	0	0	0	0		0	0	0
	miles	85	120	75	10	290		10	0	10
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000
56-60	injury accidents	1	0	0	0	1		0	0	0
	miles	75	115	70	5	265		10	0	10
	rate	.0133	.0000	.0000	.0000	.0038		.0000	.0000	.0000

continued

		Boys						Girls		
		Pre	Con	Full	Sim	All		Con	Full	All
61-65	injury accidents	1	0	0	0	1				
	miles	50	80	55	5	200				
	rate	.0200	.0000	.0000	.0000	.0000				
66-70	injury accidents	0	0	0	0	0				
	miles	50	72	49	5	176				
	rate	.0000	.0000	.0000	.0000	.0000				
71-75	injury accidents	1	0	0	0	1				
	miles	30	55	35	0	120				
	rate	.0333	.0000	.0000	.0000	.0100				
76-80	injury accidents	0	0	0	0	0				
	miles	20	40	30	0	90				
	rate	.0000	.0000	.0000	.0000	.0000				
81-85	injury accidents	0	0	0	0	0				
	miles	20	25	25	0	70				
	rate	.0000	.0000	.0000	.0000	.0000				
86-90	injury accidents	0	0	0	0	0				
	miles	15	25	25	0	65				
	rate	.0000	.0000	.0000	.0000	.0000				
91-95	injury accidents	0	0	0	0	0				
	miles	15	20	25	0	60				
	rate	.0000	.0000	.0000	.0000	.0000				
96-99	injury accidents	0	0	0	0	0				
	miles	12	16	20	0	48				
	rate	.0000	.0000	.0000	.0000	.0000				

TABLE 4.7.4 : INJURY ACCIDENT RATE PER 6 MONTHS OF DRIVING EXPERIENCE

		Boys					Girls		
		Pre	Con	Full	Sim	All	Con	Full	All
0-6	injury accidents	0	8	1	2	11	3	2	5
	months	559	1440	1267	84	3350	957	821	1952
	rate	.0000	.0056	.0008	.0238	.0033	.0031	.0024	.0026
7-12	injury accidents	3	6	3	0	12	2	1	3
	months	532	1379	1231	84	3226	943	785	1943
	rate	.0056	.0044	.0024	.0000	.0037	.0021	.0013	.0015
13-18	injury accidents	1	3	3	0	7	1	0	1
	months	508	1249	1204	92	3043	894	725	1826
	rate	.0020	.0024	.0025	.0000	.0023	.0011	.0000	.0005
19-24	injury accidents	1	2	0	1	4	0	0	0
	months	487	1149	1149	78	2843	0	0	0
	rate	.0021	.0017	.0000	.0128	.0014	.0000	.0000	.0000
25-30	injury accidents	1	0	2	1	4	0	1	1
	months	450	1039	1113	77	2679	716	648	1553
	rate	.0022	.0000	.0018	.0130	.0015	.0000	.0015	.0006
31-36	injury accidents	2	0	0	0	2	0	1	1
	months	355	872	1006	67	2300	530	564	1261
	rate	.0056	.0000	.0000	.0000	.0009	.0000	.0018	.0008
37-42	injury accidents	2	0	1	0	3	1	0	1
	months	385	689	601	65	1740	384	364	880
	rate	.0052	.0000	.0017	.0000	.0017	.0026	.0000	.0011
43-48	injury accidents	3	1	0	0	4			
	months	332	499	224	36	1091			
	rates	.009	.0020	.0000	.0000	.0037			
49-54	injury accidents	1	0	0	0	1			
	months	206	290	23	11	1130			
	rate	.0045	.0000	.0000	.0000	.0009			
55-60	injury accidents	1	1	0	0	2			
	months	95	167	0	0	262			
	rate	.0105	.0060	.0000	.0000	.0076			
61-66	injury accidents	0	0	0	0	0			
	months	36	58	0	0	94			
	rate	.0000	.0000	.0000	.0000	.0000			
67-72	injury accidents	0	0	0	0	0			
	months	9	31	0	0	40			
	rate	.0000	.0000	.0000	.0000	.0000			
73-78	injury accidents	0	0	0	0	0			
	months	0	6	0	0	6			
	rate	.0000	.0000	.0000	.0000	.0000			

TABLE 4.7.5 : INJURY ACCIDENT RATE PER DRIVER FOR EACH SIX MONTHS OF AGE AFTER 17TH BIRTHDAY

		Boys						Girls		
		Pre	Con	Exp	Sim	All		Con	Exp	All
0-6	injury accidents	0	1	1	0	2		0	1	1
	drivers	13	25	49	5	92		4	16	24
	rate	.0000	.0400	.0204	.0000	.0217		.0000	.0625	.0417
7-12	injury accidents	0	2	0	0	2		1	2	3
	drivers	42	104	154	10	310		56	60	129
	rate	.0000	.0192	.0000	.0000	.0065		.0179	.0333	.0233
13-18	injury accidents	1	5	3	0	9		2	0	2
	drivers	61	139	177	11	388		94	97	212
	rate	.0164	.0360	.0169	.0000	.0232		.0213	.0000	.0094
19-24	injury accidents	0	3	2	1	6		0	0	0
	drivers	66	162	187	13	428		116	105	245
	rate	.0000	.0185	.0107	.0769	.0140		.0000	.0000	.0000
25-30	injury accidents	2	1	0	0	3		0	0	0
	drivers	69	181	192	13	455		133	113	276
	rate	.0290	.0055	.0000	.0000	.0066		.0000	.0000	.0000
31-36	injury accidents	2	3	2	2	9		0	0	0
	drivers	75	201	200	14	490		143	117	290
	rate	.0267	.0050	.0100	.1429	.0184		.0000	.0000	.0000
37-42	injury accidents	2	2	0	0	4		1	1	2
	drivers	78	215	197	14	504		143	126	299
	rate	.0256	.0093	.0000	.0000	.0079		.007	.0079	.0067
43-48	injury accidents	1	1	2	1	5		1	1	2
	drivers	82	198	147	14	441		126	109	269
	rate	.0122	.0051	.0136	.0714	.0113		.0079	.0092	.0074
49-54	injury accidents	3	1	0	0	4		2	0	0
	drivers	80	156	87	8	331		94	64	191
	rate	.0375	.0064	.0000	.0000	.0121		.0213	.0000	.0000
55-60	injury accidents	2	2	0	0	4		0	0	0
	drivers	78	110	23	2	213		78	20	125
	rate	.0256	.0182	.0000	.0000	.0188		.0000	.0000	.0000
61-66	injury accidents	1	0	0	0	1		0	0	0
	drivers	50	58	2	0	110		42	1	61
	rate	.0200	.0000	.0000	.0000	.0091		.0000	.0000	.0000

continued

		Boys						Girls		
		Pre	Con	Exp	Sim	All		Con	Exp	All
67-72	injury accidents	1	0	0	0	1		0	0	0
	drivers	21	20	2	0	43		10	0	17
	rate	.0476	.0000	.0000	.0000	.0233		.0000	.0000	.0000
73-78	injury accidents	0	0	0	0	0		0	0	0
	drivers	6	10	1	0	17		0	0	4
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000
79-84	injury accidents	0	0	0	0	0		0	0	0
	drivers	1	3	0	0	4		0	0	1
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000

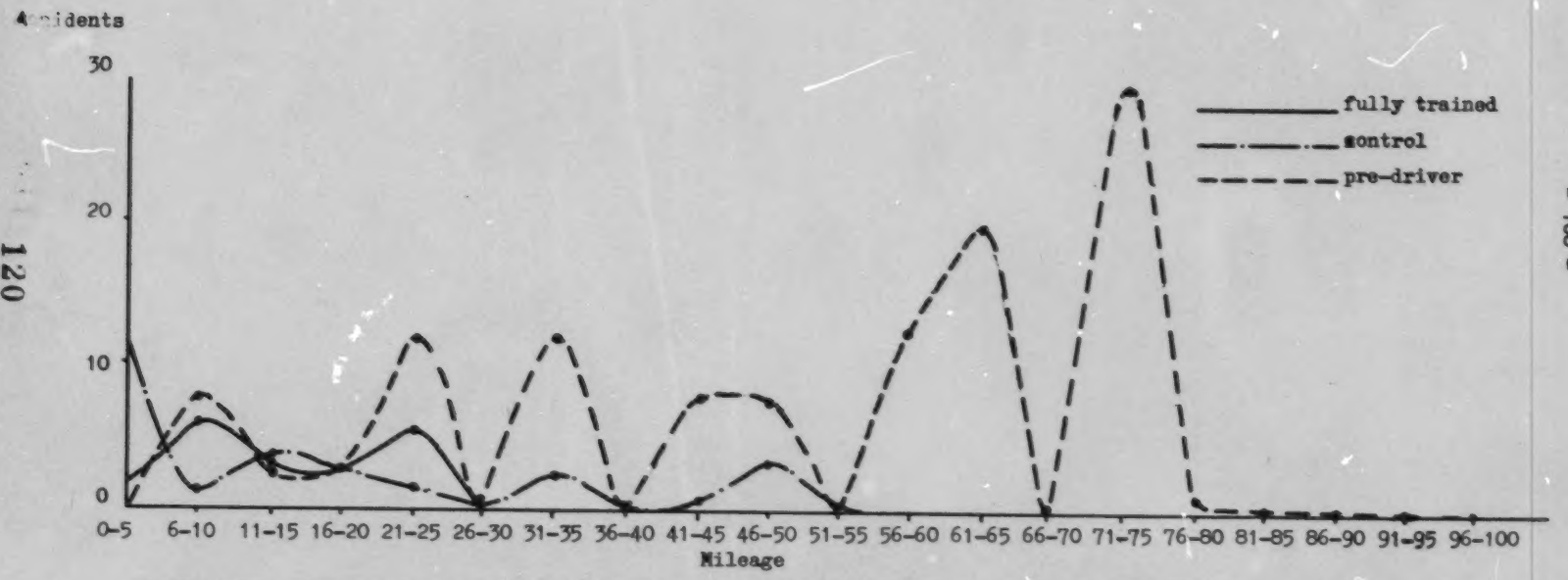


FIGURE 4.7.1 INJURY ACCIDENT RATES PER 5000 MILE RANGE TRAVELLED FOR EACH OF THE BOYS' GROUPS

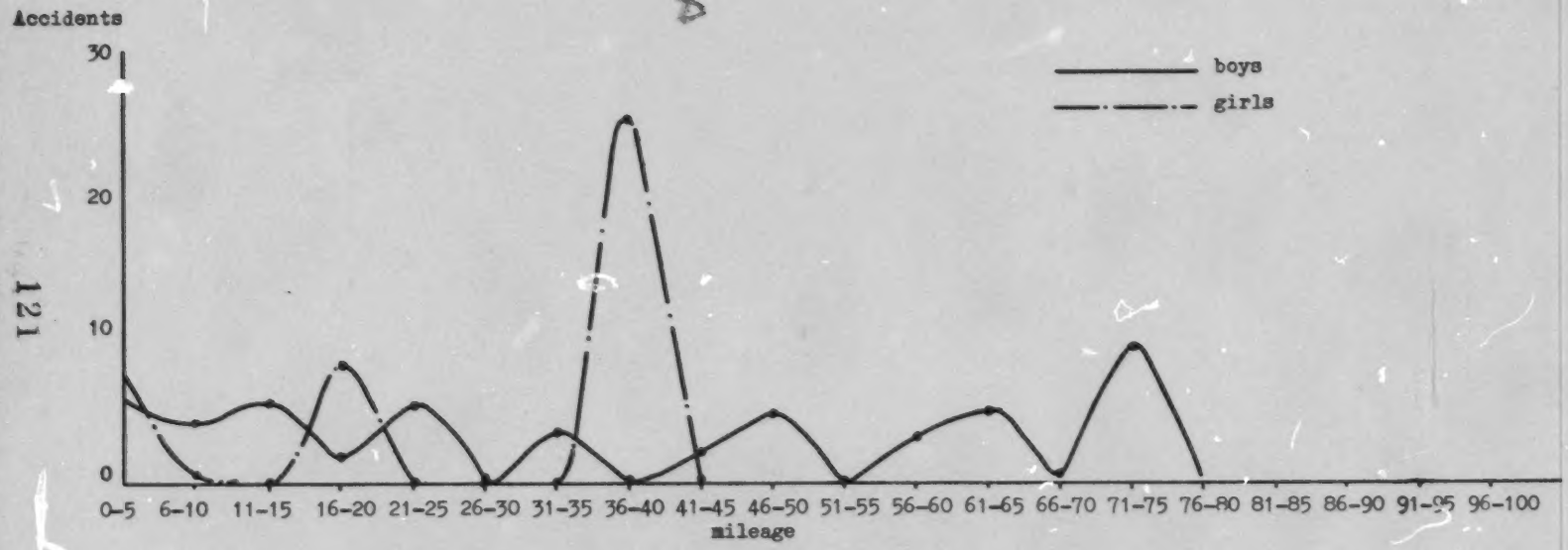


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FIGURE 4.7.2 INJURY ACCIDENT RATES PER 5000 MILE RANGE TRAVELLED FOR THE BOYS AND GIRLS

FIGURE 4.7.3 INJURY ACCIDENT RATES PER 6 MONTHS OF DRIVING EXPERIENCE FOR EACH OF THE BOYS' GROUPS

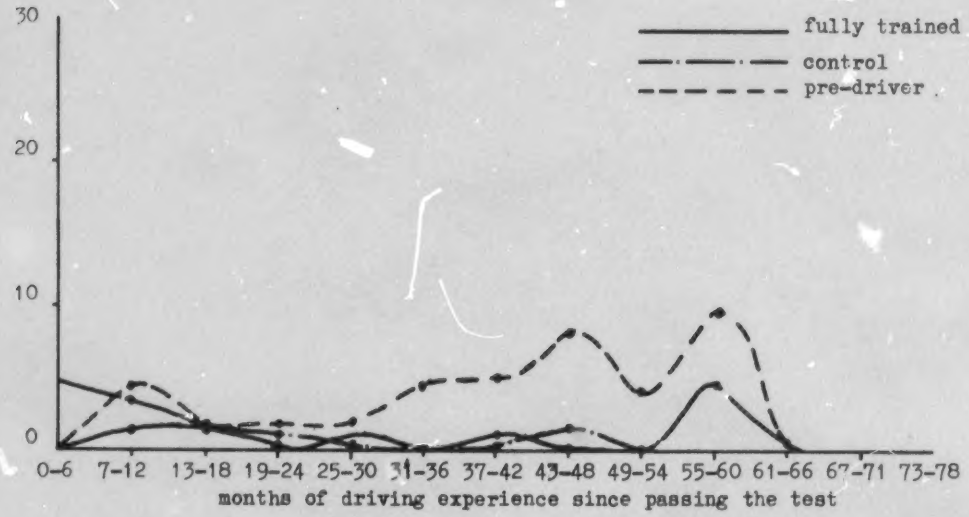


FIGURE 4.7.4 INJURY ACCIDENT RATES PER 6 MONTHS OF DRIVING EXPERIENCE FOR THE BOYS AND GIRLS

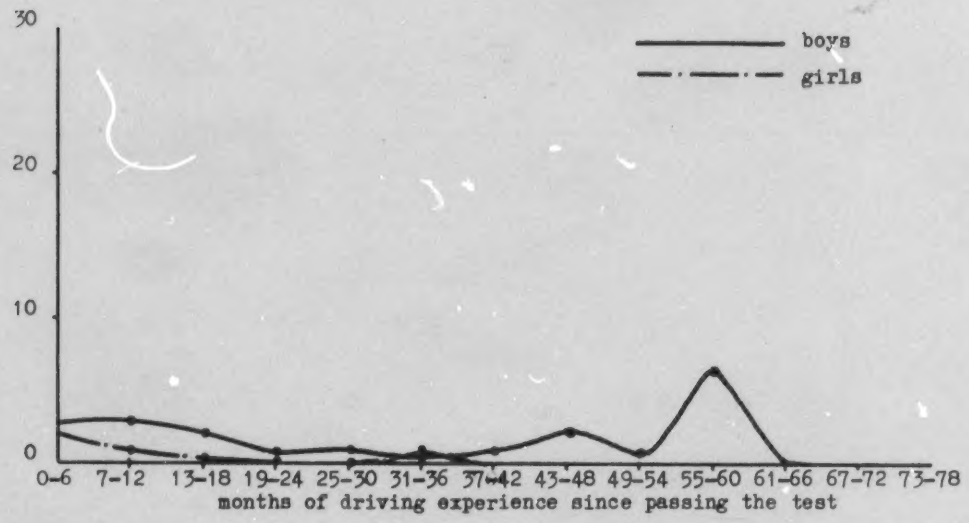


FIGURE 4.7.5 INJURY ACCIDENT RATES PER DRIVER PER 6 MONTHS OF AGE AFTER THE 17TH BIRTHDAY, FOR EACH OF THE BOYS' GROUPS

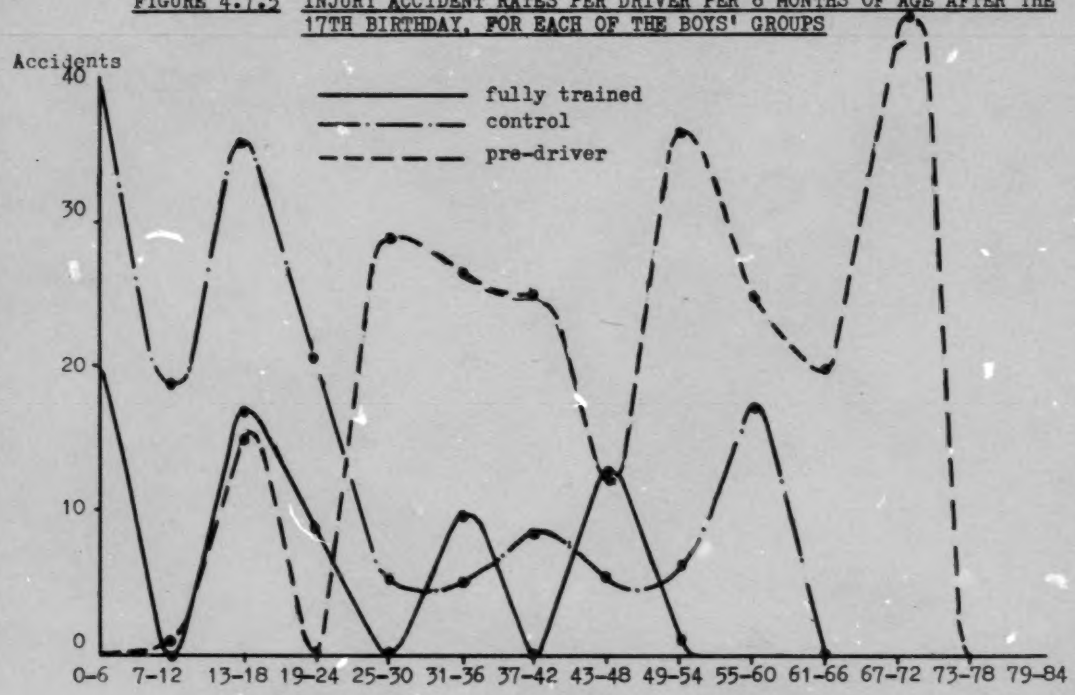
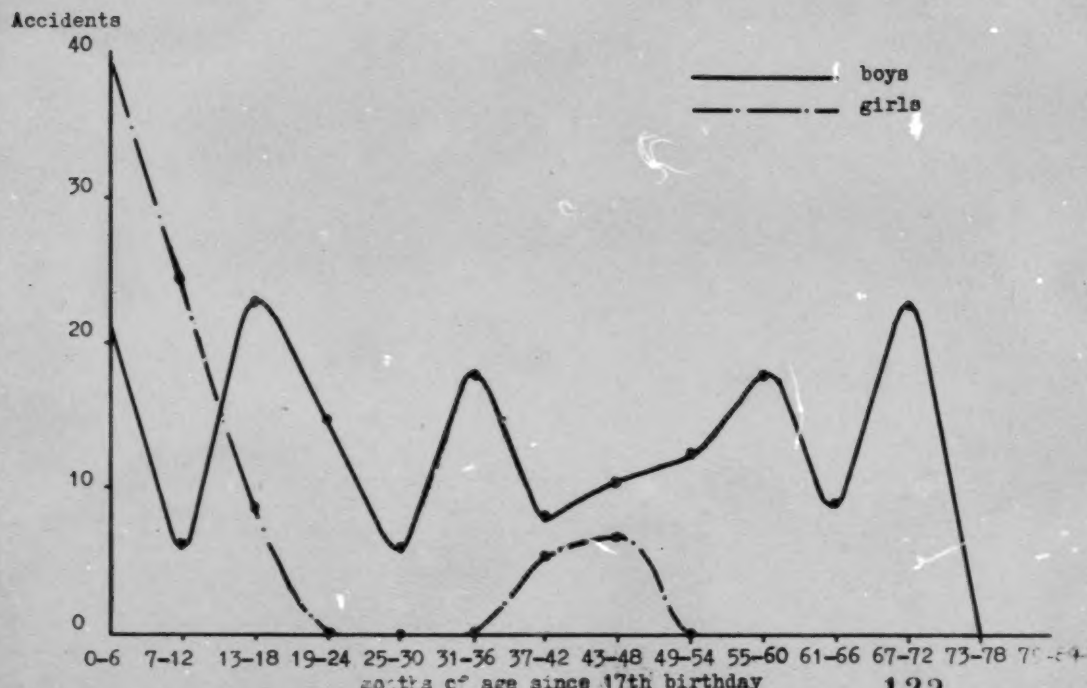


FIGURE 4.7.6 INJURY ACCIDENT RATES PER DRIVER PER 6 MONTHS OF AGE AFTER THE 17TH BIRTHDAY FOR THE BOYS' AND GIRLS' SAMPLES



4.8 The relationship between a course of driver education and the degree of responsibility for the accident

So far, all the accidents in which these young people have been involved have been considered rather than just the ones for which they were held responsible. To a certain extent, accident involvement is a useful criterion since inherent in the concept of a safe driver is the driver's ability to avoid not only causing an accident but also being involved in one. If a course of driver education aims to train a driver so that he will be safer on the roads, then both responsibility for the accident and accident involvement must be considered as criteria in any evaluation. However, since there exist some situations where it is impossible to avoid being involved in an accident, the major aim of a course of driver education is to train people to avoid causing an accident. Therefore, in this section, the degree of responsibility for causing the accident will be examined.

Any member of the sample who was involved in an accident was asked to assign responsibility for the accident to the various people involved in the accident (Appendix 3.3.2, question 32). This was one question where the answers were found to vary systematically. Some students described the same accident twice because they had forgotten that they had already given the information to the University. It was found that the further away in time they were from the accident, the more likely they were to assign to themselves less responsibility for the accident.

As each accident description form was coded, an attempt was made to assess as objectively as possible with the information available the student's responsibility for the accident. Such factors as who paid for the repair of the vehicles were taken into account. The basis of the assessment was the accident situation and the correct procedure as laid down by the Highway Code. Needless to say, this was not always a simple task as the information was not always adequate. Thus, while there may be considerable doubt as to the accuracy of our assessment of who was legally to blame, since it was done without knowing at the time to which group the driver belonged, there is no reason to suspect a bias between the groups.

It will be seen from Table 5.1.1 which shows the boys' self-rating of their responsibility for the accident that approximately 35% of each of the boys' groups considered themselves in no way responsible for the accident. There was greater variation in their rating of full responsibility, although generally a smaller percentage considered themselves to be wholly to blame for the accident. More of the fully trained boys considered themselves responsible for the accident. Table 5.1.2 shows the girls' self-rating of responsibility for the accident. Fewer of the fully trained girls considered that they were not to blame and more of that group considered themselves wholly to blame for the accident.

Tables 5.1.1 and 5.1.2 also show the assigned responsibility for the accidents for each of the boys' and girls' groups respectively. In the boys' sample, the main factor that emerges is that they were responsible for more than half of the accidents and not to blame at all for about one third of them. There was little variation between the groups. Table 5.1.2 shows that far fewer of the fully trained girls were not to blame for their accidents and slightly more of them were to blame for their accidents. For the pre-driver and control groups, assigned responsibility for the accident was apparent in more than half of the accidents.

To conclude, when assigned responsibility only is considered, both the pre-driver trained boys were found to have a better record than the other boys' groups, and the control girls had the best record among the girls' sample, not only because they were without any blame in more of their accidents but also

because they were fully to blame for a smaller percentage of their accidents. Using this criterion, the pre-driver trained groups had the best record. However, since the size of the differences are very small, these results should be interpreted cautiously.

For the purpose of improving one's driving, it is more important that the students should be able to appraise realistically when they are responsible than when they are not responsible for the accident. It seems that this should be a major objective in driver education - namely to ensure that the students understand the correct road procedure and that avoiding an accident is within their own control in many instances. When assessing the students' responsibility for the accident, particularly in those cases where they were wholly to blame, the students' tendency to blame the other driver, faulty brakes, bad road design and other extraneous causes was very marked.

4.8.1 Accident involvement and responsibility and mileage, experience and age

So far, the effect of driver education on accident responsibility and involvement has been considered independently of the effect of experience. The aim in this section is to see how accident involvement and responsibility vary with time and whether driver education has any effect on this. All accidents were therefore categorized on the basis of whether the driver in the sample had contributed to the accident by an error in his driving. That is, the assigned responsibility was used as a criterion. All accidents in which the students were less than 50% to blame were assigned to one group (the accident involved group) and all the accidents in which the students were more than 50% to blame, to the other group (accident responsible group). Those accidents where the sample were thought to be 50% to blame were not considered in this analysis. Consequently, there will be a few discrepancies between these rates and the ones in previous sections. Three aspects of time and experience will be considered, namely miles, number of months after passing the test and the age of the student.

Accident rates per 1,000 miles were then computed in order to see the relationship between legal responsibility for the accident, as assigned by the research team, mileage and driver education. Table 4.8.1 shows the accident rates per mile. It can be seen that those accidents where the sample were assigned more than 50% blame occurred twice as often as those where they were less than 50% responsible. There was little consistent variation within the groups of boys and girls for either kind of accident. When the boys and girls are compared, the girls have slightly higher accident rates in the first 5,000 miles, but lower subsequently, than the boys, for both types of accidents.

When accident rates were computed per 5,000 miles for different ranges of mileage for those accidents where the sample were not legally to blame (Table 4.8.2) and for those where they were legally to blame (Table 4.8.3), it was found that there was a significant downward trend. This would indicate that both the ability to avoid causing an accident and the ability to avoid becoming involved in an accident as the "innocent" party improve with driving experience as measured by total mileage. It can be seen that the involvement rates are lower than the responsibility rates and that they decline with experience. There is some variation between the groups within each range of mileage, but the differences are not very large or consistent. Figures 4.8.1 - 4.8.4. show rates per mile for accident involvement and accident responsibility for each of the boys' and girls' groups in graphical form.

Table 4.8.4 shows the average accident rates per six months of driving experience according to whether they were assigned more or less than 50% legal responsibility. It can be seen the rates are higher when the drivers are to blame than when they are not to blame, for both boys and girls. Generally, the driver trained students had the best record - but in no case was the difference significant at the 5% level.

Tables 4.8.5 and 4.8.6 show the relationship between length of driving experience as measured by the number of months since passing the driving test and accident involvement when not to blame and when held to be legally responsible for the accident. The first point to emerge is that the accident involvement is generally lower than the responsibility rates in the first few years of driving and it decreases with time. The responsibility rates also decline with time. In both cases, the downward trend is statistically significant. In both cases, the rates tend to be lower for the fully trained groups. This is to be expected since they drive fewer miles per month. When the boys and girls are compared, it can be seen that the same overall (downward) trend is apparent, and that the girls' rates are lower than the boys. This information is presented in graphical form in Figures 4.8.5 - 4.8.8.

Tables 4.8.7 and 4.8.8 show the accident involvement and responsibility rates per driver per 6 months of age after the minimum licensing age for each of the groups of boys and girls. These rates are calculated by dividing the number of accidents occurring at a particular age by the number of drivers who have ever driven when they were that age. Again the accident involvement rates are consistently lower than the responsibility rates and generally decline with increasing age and although this trend was not statistically significant. The responsibility rates also decline as the groups get older. It can be seen that apart from the first six months after their 17th birthday, the girls' rates tend to be lower than that of the boys. This information is presented in graphical form in Figures 4.8.9 - 4.8.12.

It is therefore difficult to draw any conclusions about the effect of a driver training course on the accident involvement and responsibility rates when mileage, experience and age are also considered. There appears to have been little observable effect on accident involvement and responsibility that cannot be accounted for by differences in their mileage. Similarly differences between the boys' and girls' accident record seem to be accounted for primarily by differences in their mileage.

When a similar analysis was carried out (Shaoul, 1972) a second upward trend was noted after the rates had declined for some time for both involvement and responsibility accident rates per mile, month of driving experience and age. This was not substantiated by this analyis and highlights the importance of having a sufficiently large sample.

This analysis has proved useful in that it has been possible to calculate these two types of rates and to observe the trend as experience and age increases. The major point was that most rates decline. This would suggest that as experience increases, young drivers become more adept at avoiding accidents as well as causing them. It is particularly interesting that accident involvement declines because it suggests that inexperience contributes to accident frequency and it takes time, skill and practice in order to recognise approaching hazards and to avoid becoming involved in an accident. Perhaps the major implication is that few accidents could not be avoided even in those instances where a driver is in no way to blame (legally) for the accident. The greater time taken for the responsibility rate to decrease indicates that far greater skill and practice is needed to avoid causing an accident. While this can be stated at a very general level, there is no data to suggest what it is that is being learned, nor how it is being learned.

It seems to imply that in order to reduce these rates, greater emphasis needs to be placed on the degree of uncertainty in the road/traffic situation and on anticipating the actions of other road users. Two aspects of unskilled driving performance appear to result in accidents - namely a positive action (error) which causes an accident and a negative action (lack of anticipation - perceptual - or inability to avert - motor skill) which transforms a

potentially hazardous situation into an accident. Generally, the aim in driver education was to show learners the correct road procedures. There is evidence that this is insufficient. It could pay more attention to anticipation - a subject which lends itself to classroom instruction. For example, filmed sequences, slides or diagrams might be of use in showing students the range of possible manoeuvres that a driver may carry out when he signals his intention to pull out by flashing his right indicator. Greater awareness of the difficulties and needs of other road users could be emphasised, particularly large vehicles and two-wheeled vehicles. In other words, it seems important to substitute classroom instruction for on the road experience not only for teaching procedures but also for helping them develop judgemental and perceptual skills.

4.9 Conclusions

In attempting to assess the effect of driver education on accident frequencies, much has been learned about the role of cognitive factors in safe driving. Driver education was usually observed to be significantly related to a reduction in accidents. However, an investigation into the nature of this relationship showed that it was one of association with a third variable, namely experience and exposure to risk, rather than a direct causal one. Accidents were related to experience and exposure to risk which had been reduced by driver education. However in so far as the individual driver's chance of being involved in an accident is dependent on his experience, training, by reducing mileage, may for the group as a whole reduce accidents in the short term but it has not been shown to affect the individual's involvement in accidents in the long term.

Thus while the cognitive factor appears to be important in safe driving, this has been shown to be derived from the practical activity of driving rather than from classroom instruction in the form given to the students in this experiment. It would appear that little had been learned on the course that was instrumental to safety, as reflected negatively in accident rates, as opposed to success in achieving the driving test standard. In so far as the cognitive factor has been shown to be important, it implies that in principle training ought to be capable of preparing a driver to drive safely.

This study has shown the critical importance of exposure to risk and driving experience for safety. There was little evidence to suggest that it was the individual characteristics of the young person per se which was responsible for accident involvement. The evidence points strongly to the activity of driving and the contraints of the car/road/traffic system as being primarily responsible for accidents.

Table 4.8.1 : Accident rates per 1000 miles - according to legal responsibility

Accident rate:	Pre	Control	Full	Sim	Total	X^2
Boys						
less than 50% blame	.0143	.0128	.0128	.0029	.0132	$p > 0.05$
more than 50% blame	.0216	.0227	.0245	.0230	.0231	$p > 0.05$
Girls						
less than 50% blame	.0116	.0242	.0167	.0063	.0207	$p > 0.05$
more than 50% blame	.0233	.0311	.0585	.0316	.0781	$p > 0.05$

Table 4.8.4 : Accident rates per 6 months of driving experience - according to legal responsibility

Accident rate:	Pre	Control	Full	Sim	Total	X^2
Boys						
less than 50% blame	.0095	.0077	.0064	.0086	.0078	$p > 0.05$
more than 50% blame	.0144	.0132	.0124	.0137	.0133	$p > 0.05$
Girls						
less than 50% blame	.0031	.0060	.0022	.0018	.0043	$p > 0.05$
more than 50% blame	.0062	.0077	.0076	.0088	.0078	$p > 0.05$

TABLE 4.8.2 ACCIDENT INVOLVEMENT RATE PER 5000 MILE RANGE (NOT LEGALLY TO BLAME)

mileage		Boys						Girls				
		Pre	Con	Full	Sim	All		Pre	Con	Full	Sim	All
0-5000	accidents	9	16	17	0	42		2	19	8	1	30
	miles	414	925	832	58	2229		82	520	296	54	952
	rate	.0217	.0173	.0204	.0000	.0188		.0244	.0365	.0270	.0185	.0315
5-10,000	accidents	10	9	14	0	33		1	7	1	0	9
	miles	357	761	630	50	1848		59	312	129	36	536
	rate	.0280	.0118	.0222	.0000	.0179		.0169	.0224	.0078	.0000	.0168
11-15,000	accidents	5	13	6	2	26		0	4	1	0	5
	miles	305	636	506	45	1492		29	203	57	27	316
	rate	.0164	.0204	.0119	.0444	.0174		.0000	.0197	.0175	.0000	.0158
16-20,000	accidents	5	3	1	1	10		0	2	0	0	2
	miles	278	541	451	40	1310		25	137	32	16	210
	rate	.0180	.0055	.0022	.0250	.0076		.0000	.0146	.0000	.0000	.0095
21-25,000	accidents	2	3	6	1	12		0	1	0	0	1
	miles	244	455	325	30	1054		15	83	27	15	140
	rate	.0082	.0066	.0185	.0333	.0114		.0000	.0120	.0000	.0000	.0071
26-30,000	accidents	1	8	3	0	12		0	0	0	0	0
	miles	215	400	279	25	919		15	60	11	5	91
	rate	.0047	.0200	.0108	.0000	.0131		.0000	.0000	.0000	.0000	.0000
31-35,000	accidents	2	1	1	0	4		0	1	0	0	1
	miles	165	313	200	25	703		10	40	5	5	60
	rate	.0121	.0032	.0050	.0000	.0057		.0000	.0250	.0000	.0000	.0167
36-40,000	accidents	1	4	2	0	7		0	2	0	0	2
	miles	137	274	159	25	595		10	25	5	0	40
	rate	.0073	.0146	.0126	.0000	.0113		.0000	.0800	.0000		.0500
41-45,000	accidents	1	0	0	0	1		0	1	0		1
	miles	125	249	115	15	504		5	20	5	0	30
	rate	.0080	.0000	.0000	.0000	.0020		.0000	.0500	.0000		.0333
46-50,000	accidents	0	1	0	0	1		0	0	0		0
	miles	120	193	101	10	424		5	14	5	0	24
	rate	.0000	.0052	.0000	.0000	.0024		.0000	.0000	.0000		.0000
51-55,000	accidents	0	0	1	1	2			0			0
	miles	85	120	75	10	290			10			10
	rate	.0000	.0000	.0133	.1000	.0069			.0000			.0000

continued

mileage		Boys						Girls				
		Pre	Con	Full	Sim	All		Pre	Con	Full	Sim	All
56-60,000	accidents	1	1	0	0	2			0			0
	miles	75	115	70	5	265			10			10
	rate	.0133	.0087	.0000	.0000	.0075			.0000			.0000
61-65,000	accidents	0	1	0	0	1						
	miles	50	80	55	5	200						
	rate	.0000	.0125	.0000	.0000	.0050						
66-70,000	accidents	0	1	0	0	1						
	miles	50	72	49	5	176						
	rate	.0000	.0139	.0000	.0000	.0057						
71-75,000	accidents	0	0	0		0						
	miles	30	55	35		120						
	rate	.0000	.0000	.0000		.0000						
76-80,000	accidents	1	1	0		2						
	miles	20	40	30		90						
	rate	.0500	.0250	.0000		.0222						
81-85,000	accidents	0	0	0		0						
	miles	20	25	25		70						
	rate	.0000	.0000	.0000		.0000						
86-90,000	accidents	0	0	0		0						
	miles	15	25	25		65						
	rate	.0000	.0000	.0000		.0000						
91-95,000	accidents	0	0	0		0						
	miles	15	20	25		60						
	rate	.0000	.0000	.0000		.0000						
96-100,000	accidents	0	1	0		1						
	miles	12	16	20		48						
	rate	.0000	.0625	.0000		.0208						

TABLE 4.8.3 ACCIDENT RESPONSIBILITY RATES PER 5000 MILES (LEGALLY TO BLAME)

mileage		Boys					Girls				
		Pre	Con	Full	Sim	All	Pre	Con	Full	Sim	All
0-5,000	accidents	20	63	60	5	148	6	32	35	3	76
	miles	414	925	832	58	2229	82	520	296	54	952
	rate	.0483	.0611	.0721	.0862	.0669	.0732	.0615	.1182	.0556	.0798
6-10,000	accidents	11	18	15	0	44	0	4	1	1	6
	miles	357	761	630	50	1848	59	312	129	36	536
	rate	.0308	.0237	.0238	.0000	.0238	.0000	.0128	.0078	.0278	.0112
11-15,000	accidents	3	16	4	1	24	0	5	0	0	5
	miles	305	636	506	45	1492	29	203	57	27	316
	rate	.0098	.0252	.0079	.0222	.0161	.0000	.0246	.0000	.0000	.0158
16-20,000	accidents	6	8	10	0	24	0	0	1	0	1
	miles	278	541	451	40	1310	25	137	32	16	210
	rate	.0218	.0148	.0222	.0000	.0183	.0000	.0000	.0313	.0000	.0048
21-25,000	accidents	5	1	4	1	11	0	2	0	0	2
	miles	244	455	325	30	1054	15	83	27	15	140
	rate	.0205	.0022	.0123	.0333	.0104	.0000	.0241	.0000	.0000	.0143
26-30,000	accidents	1	3	2	0	6	0	2	0	0	2
	miles	215	400	270	25	919	15	60	11	5	91
	rate	.0047	.0075	.0072	.0000	.0065	.0000	.0333	.0000	.0000	.0220
31-35,000	accidents	1	3	0	0	4	0	0	0	1	1
	miles	165	313	200	25	703	10	40	5	5	60
	rate	.0061	.0096	.0000	.0000	.0057	.0000	.0000	.0000	.0200	.0167
36-40,000	accidents	3	3	0	1	7	0	0	0	0	0
	miles	137	274	159	25	595	10	25	5	0	40
	rate	.0219	.0109	.0000	.0400	.0118	.0000	.0000	.0000		.0000
41-45,000	accidents	0	3	0	0	3	0	0	0		0
	miles	125	249	115	15	504	5	20	5	0	30
	rate	.0000	.0120	.0000	.0000	.0060	.0000	.0000	.0000		.0000
46-50,000	accidents	2	0	2	0	4	0	0	0		0
	miles	120	193	101	10	424	5	14	5	0	24
	rate	.0167	.0000	.0198	.0000	.0094	.0000	.0000	.0000		.0000
51-55,000	accidents	0	0	0	0	0		0			0
	miles	85	120	75	10	290		10			10
	rate	.0000	.0000	.0000	.0000	.0000		.0000			.0000

continued

mileage		Boys						Girls				
		Pre	Con	Full	Sim	All		Pre	Con	Full	Sim	All
56-60,000	accidents	2	0	0	0	2			0			0
	miles	75	115	70	5	265			10			10
	rate	.0267	.0000	.0000	.0000	.0075			.0000			.0000
61-65,000	accidents	1	0	0	0	1						
	miles	50	80	55	5	200						
	rate	.0200	.0000	.0000	.0000	.0050						
66-70,000	accidents	1	0	0	0	1						
	miles	50	72	49	5	176						
	rate	.0200	.0000	.0000	.0000	.0076						
71-75,000	accidents	1	1	0		2						
	miles	30	55	35	0	120						
	rate	.0333	.0182	.0000		.0167						
76-80,000	accidents	1	0	0		1						
	miles	20	40	30		90						
	rate	.0500	.0000	.0000		.0111						
81-85,000	accidents	0	0	0		0						
	miles	20	25	25		70						
	rate	.0000	.0000	.0000		.0000						
86-90,000	accidents	0	0	0		0						
	miles	15	25	25		65						
	rate	.0000	.0000	.0000		.0000						
91-95,000	accidents	0	0	0		0						
	miles	15	20	25		60						
	rate	.0000	.0000	.0000		.0000						
96-99,000	accidents	0	0	1		1						
	miles	12	16	20		48						
	rate	.0000	.0000	.0500		.0208						

TABLE 4.8.5 ACCIDENT INVOLVEMENT PER 6 MONTHS OF DRIVING EXPERIENCE (NOT TO BLAME)

months of driving experience		Boys					Girls				
		Pre	Con	Full	Sim	All	Pre	Con	Full	Sim	All
0-6	accidents	8	14	6	2	30	1	14	2	1	18
	months	559	1440	1267	84	3350	144	957	821	30	1952
	rate	.0143	.0097	.0047	.0238	.0090	.0069	.0146	.0024	.0333	.0092
7-12	accidents	10	11	14	1	36	1	4	3	0	8
	months	532	1379	1231	84	3226	130	943	785	85	1943
	rate	.0188	.0080	.0114	.0119	.0112	.0077	.0042	.0038	.0000	.0041
13-18	accidents	7	7	14	0	28	0	6	1	0	7
	months	508	1249	1204	82	3043	123	894	725	84	1826
	rate	.0138	.0056	.0116	.0000	.0092	.0000	.0067	.0014	.0000	.0038
19-24	accidents	1	9	2	0	12	0	3	2	0	5
	months	487	1149	1149	78	2843	118	812	691	83	1704
	rate	.0021	.0078	.0017	.0000	.0042	.0000	.0037	.0029	.0000	.0032
25-30	accidents	3	7	4	1	15	0	3	2	0	5
	months	450	1039	1113	77	2679	114	716	648	75	1553
	rate	.0067	.0067	.0036	.0130	.0056	.0000	.0042	.0031	.0000	.0032
31-36	accidents	1	3	6	0	10	0	1	0	0	1
	months	355	872	1006	67	2300	100	530	564	67	1261
	rate	.0028	.0034	.0060	.0000	.0043	.0000	.0019	.0000	.0000	.0008
37-42	accidents	5	7	4	1	17	1	1	0	0	2
	months	385	689	601	65	1740	89	384	364	43	880
	rate	.0130	.0102	.0067	.0154	.0098	.0112	.0026	.0000	.0000	.0023
43-48	accidents	4	4	1	0	9	0	2	0	0	2
	months	332	499	224	36	1091	72	302	143	33	550
	rate	.0120	.0080	.0045	.0000	.0082	.0000	.0066	.0000	.0000	.0036
49-54	accidents	0	2	0	0	2	0	1	0	0	1
	months	206	290	23	11	530	47	182	6	6	241
	rate	.0000	.0069	.0000	.0000	.0038	.0000	.0055	.0000	.0000	.0041
55-60	accidents	1	1			2	0	0			0
	months	95	167			262	21	50			71
	rate	.0105	.0060			.0076	.0000	.0000			.0000
61-66	accidents	0	3			3	0	0			0
	months	36	58			94	19	1			20
	rate	.0000	.0517			.0319	.0000	.0000			.0000
67-72	accidents	0	0			0					
	months	9	31			40					
	rate	.0000	.0000			.0000					
73-78	accidents		0			0					
	months		6			6					
	rate		.0000			.0000					

TABLE 4.8.6 ACCIDENT RESPONSIBILITY PER 6 MONTHS OF DRIVING EXPERIENCE (LEGALLY TO BLAME)

months of driving experience		Boys						Girls				
		Pre	Con	Full	Sim	All		Pre	Con	Full	Sim	All
0-6	accidents	14	50	26	2	92		5	16	17	2	40
	months	559	1440	1267	84	3350		144	957	821	30	1952
	rate	.0250	.0347	.0205	.0238	.0275		.0847	.0167	.0207	.0067	.0205
7-12	accidents	12	20	17	1	50		1	6	8	1	16
	months	532	1379	1231	84	3226		130	943	785	85	1943
	rate	.0226	.0145	.0138	.0119	.0155		.0077	.0064	.0102	.0118	.0082
13-18	accidents	5	9	16	0	30		0	14	6	0	20
	months	508	1249	1204	82	3043		123	894	725	84	1826
	rate	.0098	.0072	.0133	.0000	.0099		.0000	.0157	.0083	.0000	.0110
19-24	accidents	6	13	14	1	34		0	0	0	1	1
	months	487	1149	1149	78	2843		118	812	691	83	1704
	rate	.0123	.0113	.0122	.0128	.0120		.0000	.0000	.0000	.0120	.0006
25-30	accidents	4	10	14	1	29		0	2	1	1	4
	months	450	1039	1113	77	2679		114	716	648	75	1553
	rate	.0089	.0096	.0126	.0128	.0108		.0000	.0028	.0015	.0133	.0026
31-36	accidents	8	6	8	1	23		0	4	2	0	6
	months	355	872	1006	67	2300		100	530	564	67	1261
	rate	.0225	.0069	.0080	.0149	.0100		.0000	.0075	.0035	.0000	.0048
37-42	accidents	3	8	3	2	16		0	0	1	0	1
	months	385	689	601	65	1740		89	384	364	43	880
	rate	.0078	.0116	.0050	.0308	.0092		.0000	.0000	.0027	.0000	.0011
43-48	accidents	4	0	0	0	4		0	2	0	0	2
	months	332	499	224	36	1091		72	302	143	33	550
	rate	.0120	.0000	.0000	.0000	.0037		.0000	.0033	.0000	.0000	.0036
49-54	accidents	1	1	0	0	2		0	1	0	0	1
	months	206	290	23	11	530		47	182	6	6	241
	rate	.0049	.0034	.0000	.0000	.0038		.0000	.0055	.0000	.0000	.0041
55-60	accidents	2	2			4		0	0			0
	months	95	167			262		21	50			71
	rate	.0211	.0120			.0153		.0000	.0000			.0000
61-66	accidents	0	0			0		0	0			0
	months	36	58			94		19	1			20
	rate	.0000	.0000			.0000		.0000	.0000			.0000
67-72	accidents	0	0			0						
	months	9	31			40						
	rate	.0000	.0000			.0000						
73-78	accidents		0			0						
	months		6			6						
	rate		.0000			.0000						

TABLE 4.8.7 ACCIDENT INVOLVEMENT PER DRIVER PER 6 MONTHS OF AGE AFTER 17TH BIRTHDAY (NOT LEGALLY TO BLAME)

		Boys					Girls				
		Pre	Con	Full	Sim	All	Pre	Con	Full	Sim	All
0-6	accidents	2	2	2	0	6	0	3	0	0	3
	drivers	13	25	49	5	92	0	4	16	0	24
	rate	.1538	.0800	.0408	.0000	.0652	.0000	.7500	.0000	.0000	.1250
7-12	accidents	4	7	6	0	17	1	6	0	0	7
	drivers	42	104	154	10	310	6	56	60	7	129
	rate	.0952	.0673	.0390	.0000	.0548	.1667	.1071	.0000	.0000	.0503
13-18	accidents	8	7	10	0	25	1	4	3	0	8
	drivers	61	139	177	11	388	10	94	97	11	212
	rate	.1311	.0503	.0565	.0000	.0644	.1000	.0426	.0309	.0000	.0377
19-24	accidents	2	7	10	0	19	0	3	1	0	4
	drivers	66	162	187	13	428	11	116	105	13	245
	rate	.0303	.0432	.0535	.0000	.0444	.0000	.0259	.0095	.0000	.0163
25-30	accidents	5	9	6	1	21	0	3	2	1	6
	drivers	69	181	192	13	455	16	133	113	14	276
	rate	.0725	.0497	.0313	.0769	.0462	.0000	.0226	.0177	.0714	.0217
31-36	accidents	2	5	4	2	13	0	4	2	0	6
	drivers	75	201	200	14	490	16	143	117	14	290
	rate	.0267	.0249	.0200	.1429	.0265	.0000	.0280	.0171	.0000	.0207
37-42	accidents	5	6	6	2	19	0	7	0	0	7
	drivers	78	215	197	14	504	17	143	126	13	299
	rate	.0641	.0279	.0305	.1429	.0377	.0000	.0490	.0000	.0000	.0234
43-48	accidents	4	10	5	0	19	0	1	2	0	3
	drivers	82	198	147	14	441	21	126	109	13	269
	rate	.0488	.0505	.0340	.0000	.0431	.0000	.0079	.0183	.0000	.0112
49-54	accidents	4	6	2	0	12	0	3	0	0	3
	drivers	80	156	87	8	331	22	94	64	11	191
	rate	.0500	.0385	.0230	.0000	.0363	.0000	.0319	.0000	.0000	.0157
55-60	accidents	1	4	0	0	5	0	0	0	0	0
	drivers	78	110	23	2	213	22	78	20	5	125
	rate	.0128	.0364	.0000	.0000	.0235	.0000	.0000	.0000	.0000	.0000

continued

		Boys						Girls				
		Pre	Con	Full	Sim	All		Pre	Con	Full	Sim	All
61-66	accidents	1	5	0	0	6		1	1	0	0	2
	drivers	50	58	2	0	110		18	42	1	0	61
	rate	.0200	.0862	.0000	.0000	.0545		.0556	.0238	.0000	.0000	.0828
67-72	accidents	1	0	0	0	1		0	0	0	0	0
	drivers	21	20	2	0	43		7	10	0	0	17
	rate	.0476	.0000	.0000	.0000	.0233		.0000	.0000	.0000	.0000	.0000
73-78	accidents	0	0	0	0	0		0	0	0	0	0
	drivers	6	10	1	0	17		4	0	0	0	4
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000
79-84	accidents	0	0	0	0	0		0	0	0	0	0
	drivers	1	3	0	0	4		1	0	0	0	1
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000

TABLE 8.8 ACCIDENT RESPONSIBILITY PER DRIVER PER 6 MONTHS OF AGE AFTER 17TH BIRTHDAY (LEGALLY TO BLAME)

		Boys					Girls				
		Pre	Con	Full	Sim	All	Pre	Con	Full	Sim	All
0-6	accidents	7	20	12	0	39	0	1	6	1	8
	drivers	13	25	49	5	92	0	4	16	0	24
	rate	.5385	.8000	.2449	.0000	.0239	.0000	.2500	.375	.0000	.3333
7-12	accidents	7	18	14	1	40	1	3	10	0	14
	drivers	42	104	154	10	310	6	56	60	7	129
	rate	.1667	.1731	.0909	.1000	.1290	.1667	.0536	.1667	.0000	.1085
13-18	accidents	5	11	12	0	28	1	3	6	2	12
	drivers	61	139	177	11	388	10	94	97	11	212
	rate	.0820	.0791	.0678	.0000	.0722	.1000	.0319	.0619	.1818	.0566
19-24	accidents	6	12	12	2	32	0	8	6	0	14
	drivers	66	162	187	13	428	11	116	105	13	245
	rate	.0909	.0741	.0642	.1538	.0748	.0000	.0690	.0571	.0000	.0671
25-30	accidents	7	14	16	1	38	0	5	0	0	5
	drivers	69	181	192	18	455	16	133	113	14	276
	rate	.1014	.0773	.0833	.0769	.0835	.0000	.0376	.0000	.0000	.0181
31-36	accidents	4	11	18	0	33	0	7	2	1	10
	drivers	75	201	200	14	490	16	143	117	14	290
	rate	.0533	.0547	.0900	.0000	.0673	.0000	.0490	.0171	.0714	.0345
37-42	accidents	4	14	5	2	25	0	4	3	0	7
	drivers	78	215	197	14	504	17	143	126	13	299
	rate	.0513	.0651	.0254	.1429	.0496	.0000	.0280	.0238	.0000	.0234
43-48	accidents	4	12	7	2	25	2	5	1	1	9
	drivers	82	198	147	14	441	21	126	109	13	269
	rate	.0488	.0606	.0476	.1429	.0567	.0952	.0397	.0092	.0769	.0335
49-54	accidents	4	2	2	0	8	0	4	0	0	4
	drivers	80	156	87	8	331	22	94	64	11	191
	rate	.0500	.0032	.0230	.0000	.0242	.0000	.0426	.0000	.0000	.0209
55-60	accidents	4	4	0	0	8	0	4	0	0	4
	drivers	78	110	23	2	213	22	78	20	5	125
	rate	.0513	.0364	.0000	.0000	.0376	.0000	.0513	.0000	.0000	.0320
61-66	accidents	3	1	0	0	4	0	1	0	0	1
	drivers	50	58	2	0	110	18	42	1	0	61
	rate	.0600	.0172	.0000	.0000	.0364	.0000	.0238	.0000	.0000	.0164
67-72	accidents	2	0	0	0	2	0	0	0	0	0
	drivers	21	20	2	0	43	7	10	0	0	17
	rate	.0952	.0000	.0000	.0000	.0465	.0000	.0000	.0000	.0000	.0000
73-78	accidents	2	0	0	0	2	2	0	0	0	2
	drivers	6	10	1	0	17	4	0	0	0	4
	rate	.3333	.0000	.0000	.0000	.1176	.5000	.0000	.0000	.0000	.500
79-84	accidents	0	0	0	0	0	0	0	0	0	0
	drivers	1	3	0	0	4	1	0	0	0	1
	rate	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

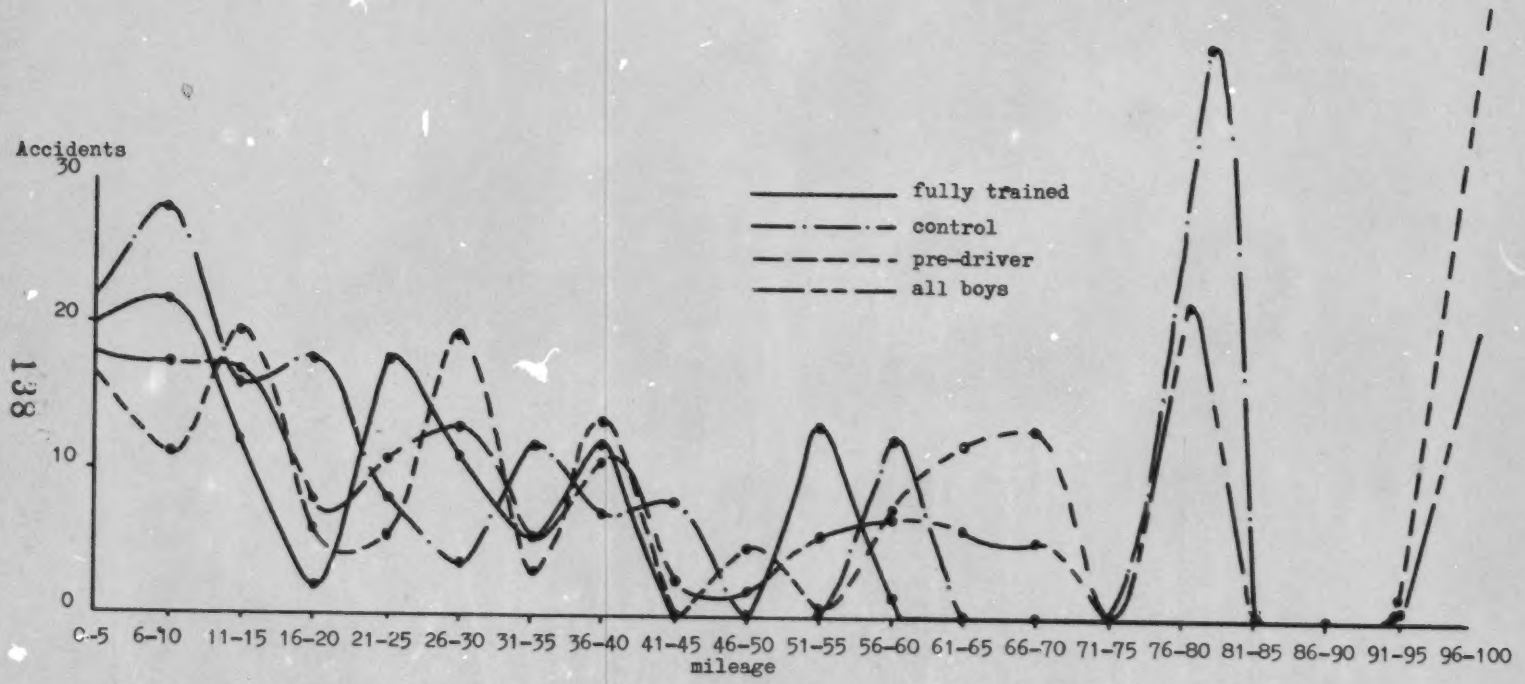


FIGURE 4.8.1 ACCIDENT INVOLVEMENT RATES PER 5000 MILES FOR EACH OF THE BOYS' GROUPS NOT LEGALLY TO BLAME

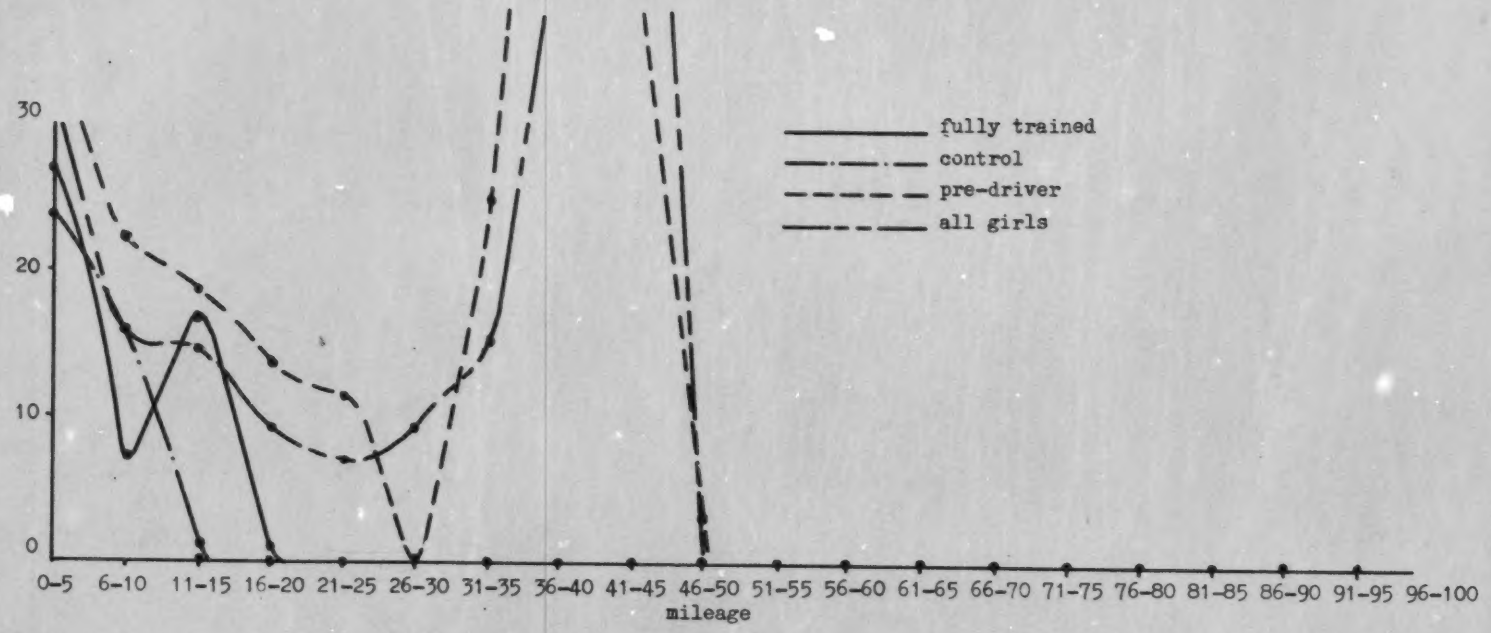


FIGURE 4.8.2 ACCIDENT INVOLVEMENT RATES PER 5000 MILES FOR EACH OF THE GIRLS' GROUPS NOT LEGALLY TO BLAME

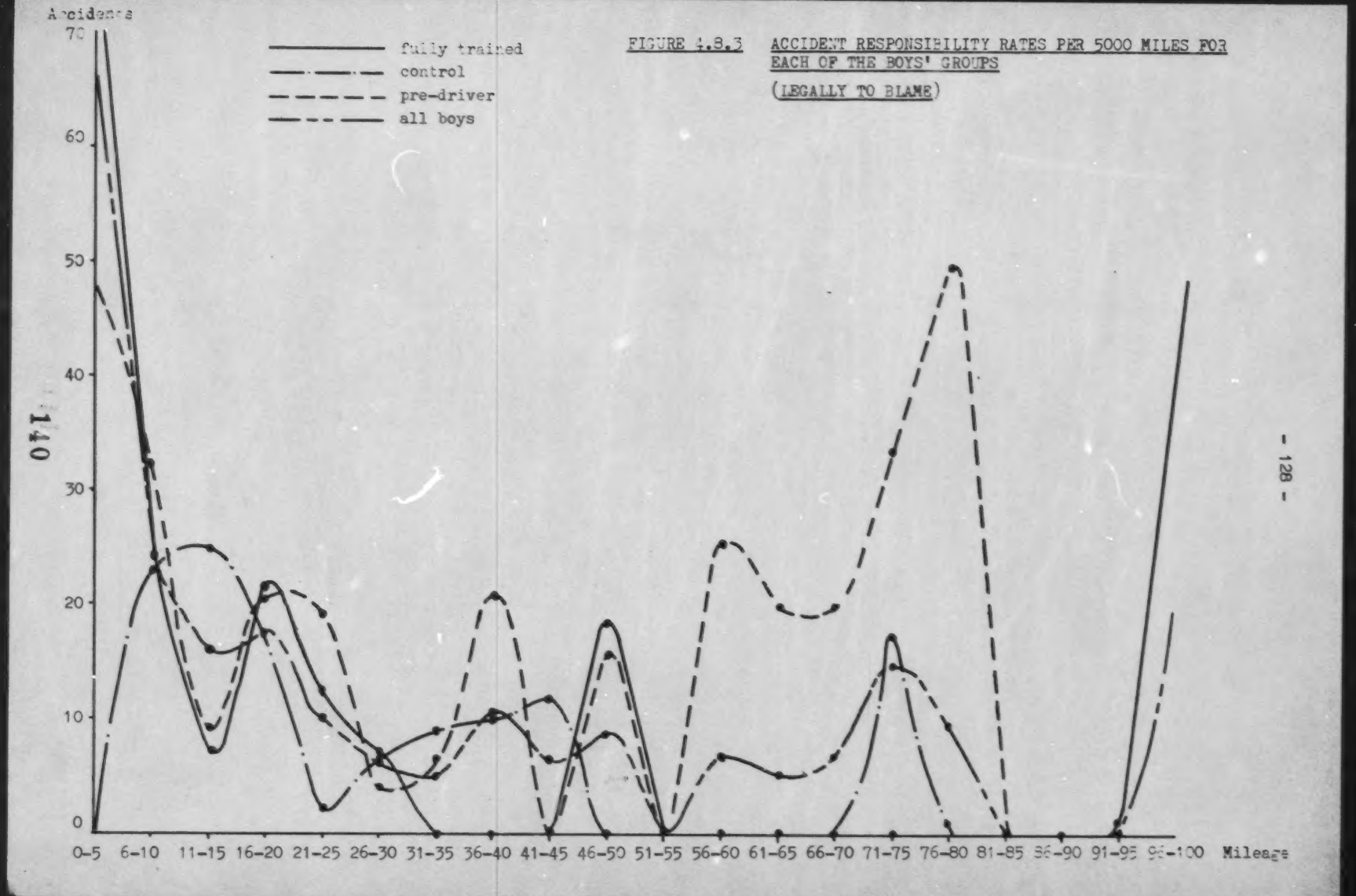


FIGURE 4.8.3 ACCIDENT RESPONSIBILITY RATES PER 5000 MILES FOR EACH OF THE BOYS' GROUPS

(LEGALLY TO BLAME)

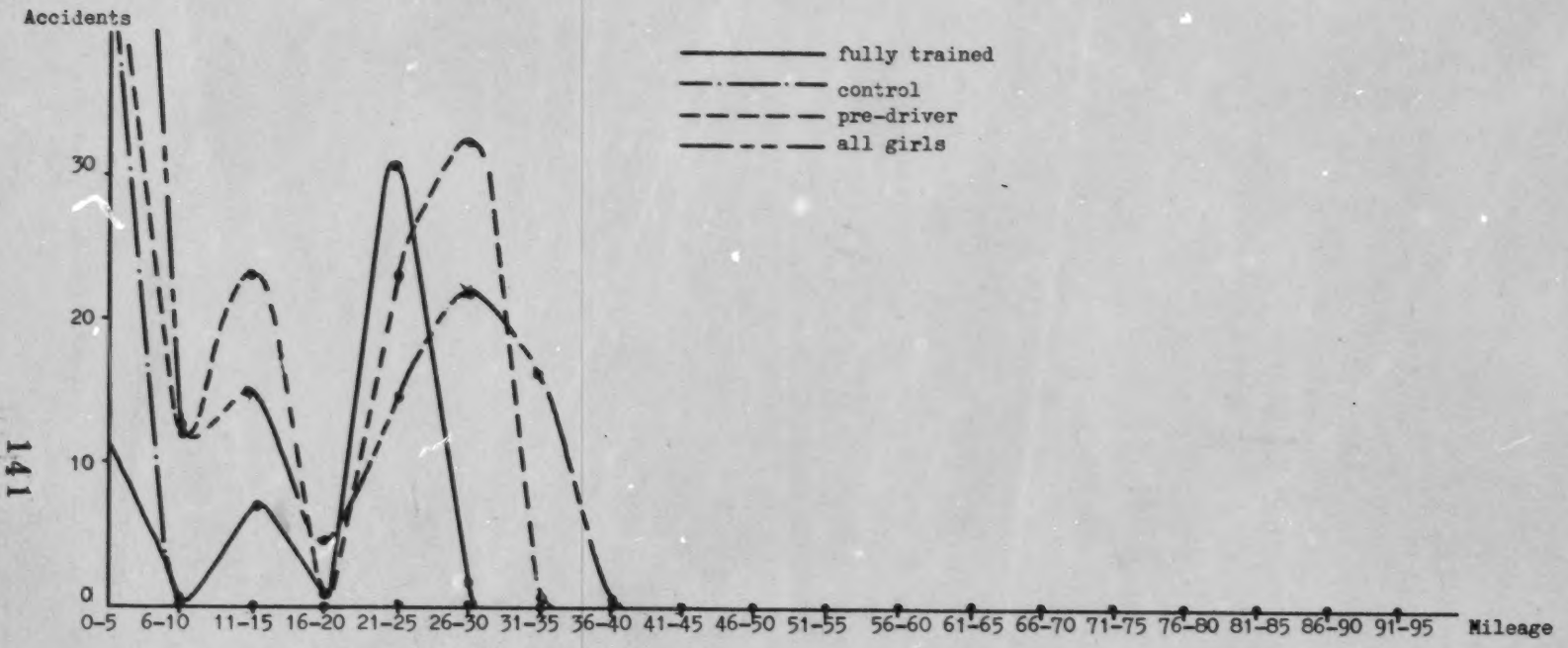


FIGURE 4.8.4 ACCIDENT RESPONSIBILITY RATES PER 5000 MILES FOR THE GIRLS' GROUPS LEGALLY TO BLAME

FIGURE 4.8.5 ACCIDENT INVOLVEMENT RATES PER 6 MONTHS OF DRIVING EXPERIENCE FOR EACH OF THE BOYS' GROUPS (NOT LEGALLY TO BLAME)

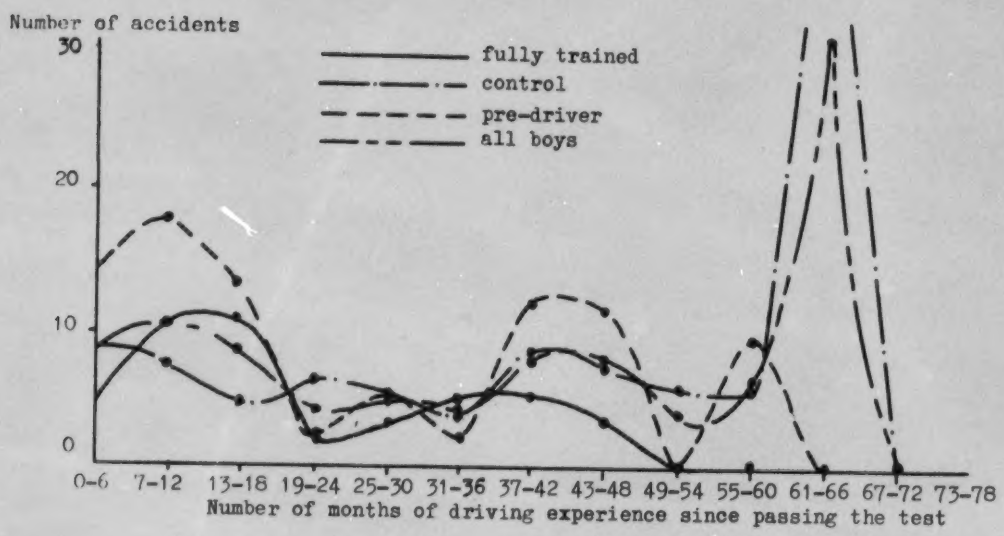


FIGURE 4.8.6 ACCIDENT INVOLVEMENT RATES PER 6 MONTHS OF DRIVING EXPERIENCE FOR EACH OF THE GIRLS' GROUPS (NOT LEGALLY TO BLAME)

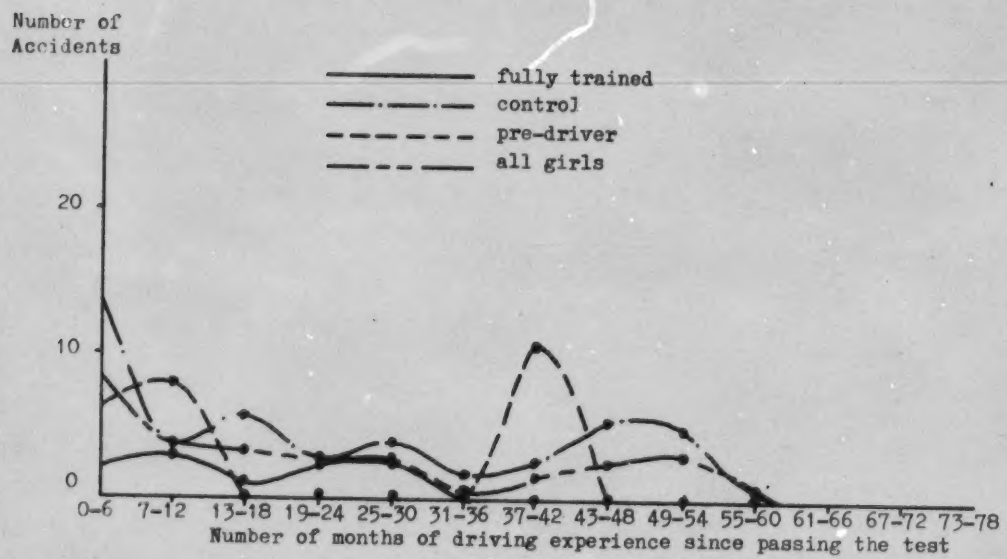


FIGURE 4.8.7 ACCIDENT RESPONSIBILITY RATES PER 6 MONTHS OF DRIVING EXPERIENCE FOR EACH OF THE BOYS' GROUPS (LEGALLY TO BLAME)

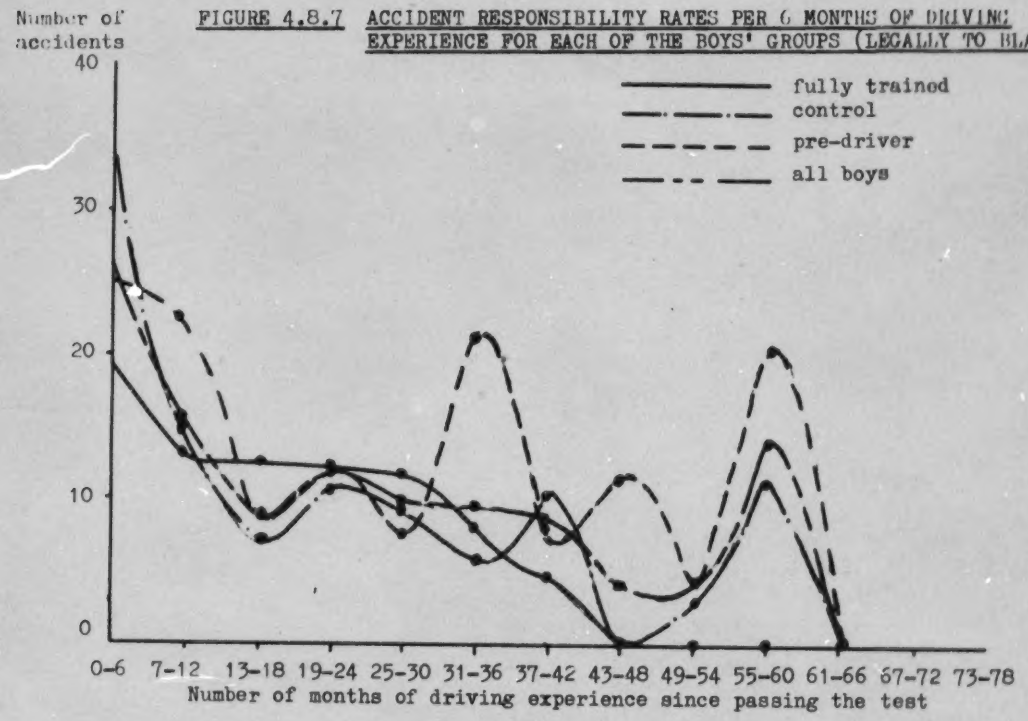


FIGURE 4.8.8 ACCIDENT RESPONSIBILITY RATES PER 6 MONTHS OF DRIVING EXPERIENCE FOR EACH OF THE GIRLS' GROUPS (LEGALLY TO BLAME)

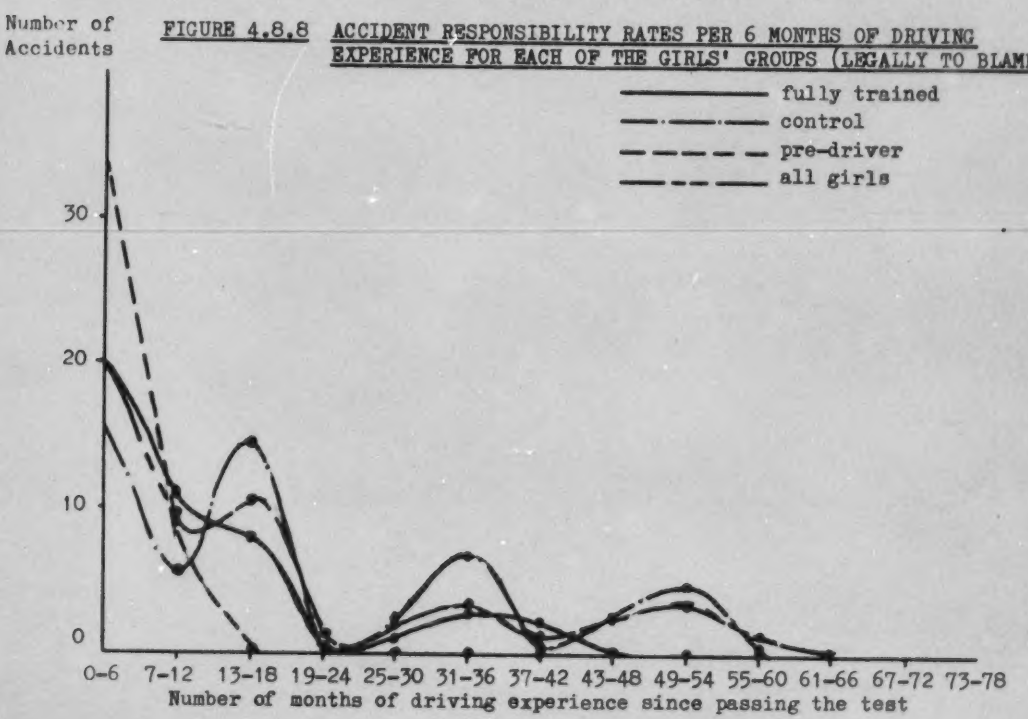


FIGURE 4.8.10 ACCIDENT INVOLVEMENT RATE PER DRIVER PER 6 MONTHS OF AGE AFTER 17TH BIRTHDAY FOR EACH OF THE GIRLS' GROUPS (NOT LEGALLY TO BLAME)

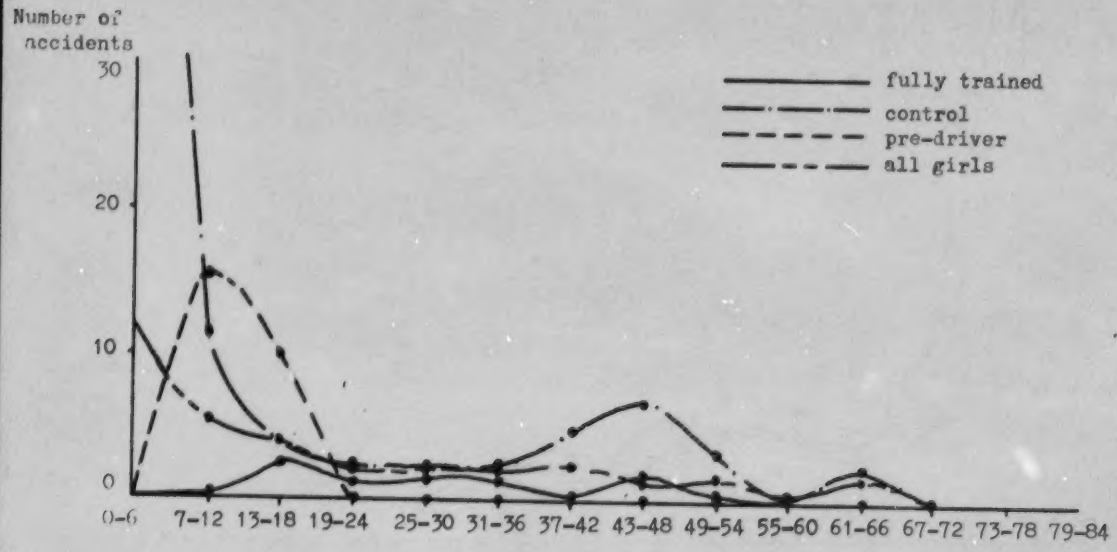


FIGURE 4.8.9 ACCIDENT INVOLVEMENT RATE PER DRIVER PER 6 MONTHS OF AGE AFTER 17TH BIRTHDAY FOR EACH OF THE BOYS' GROUPS (NOT LEGALLY TO BLAME)

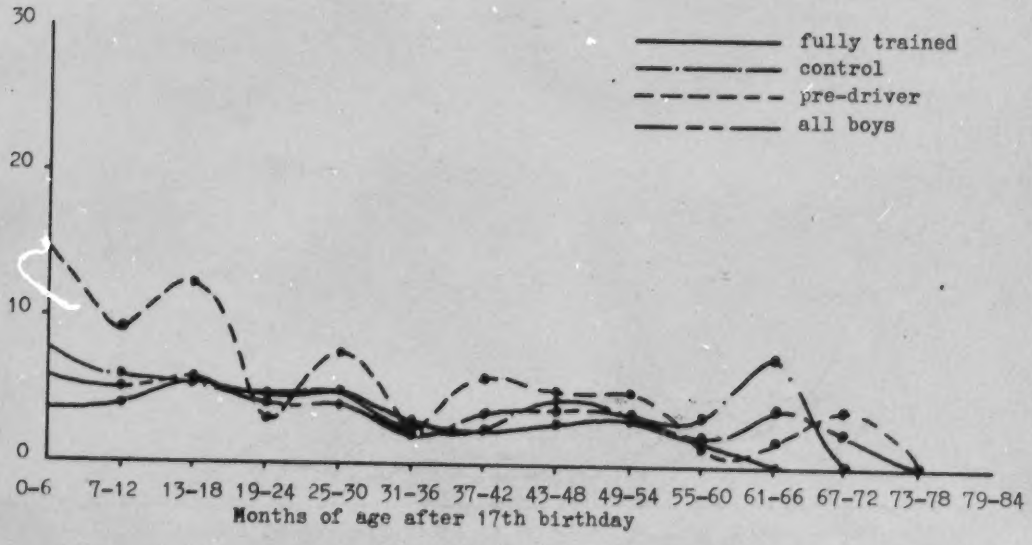


FIGURE 4.8.11 ACCIDENT RESPONSIBILITY PER DRIVER PER 6 MONTHS OF AGE AFTER 17TH BIRTHDAY FOR EACH OF THE BOYS' GROUPS (LEGALLY TO BLAME)

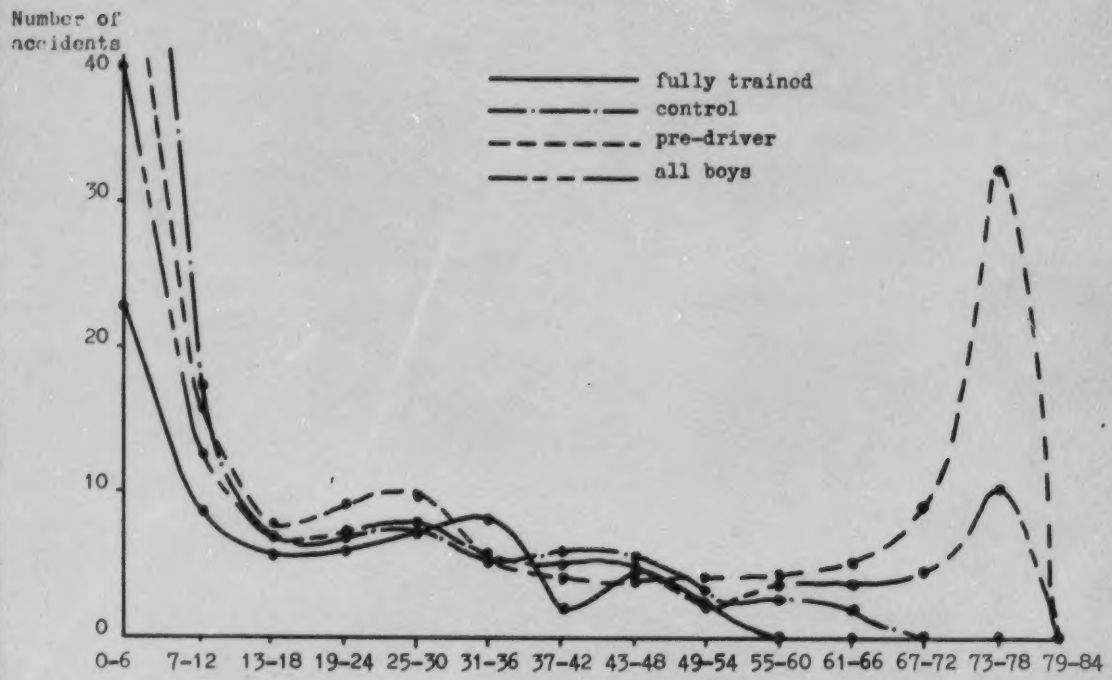
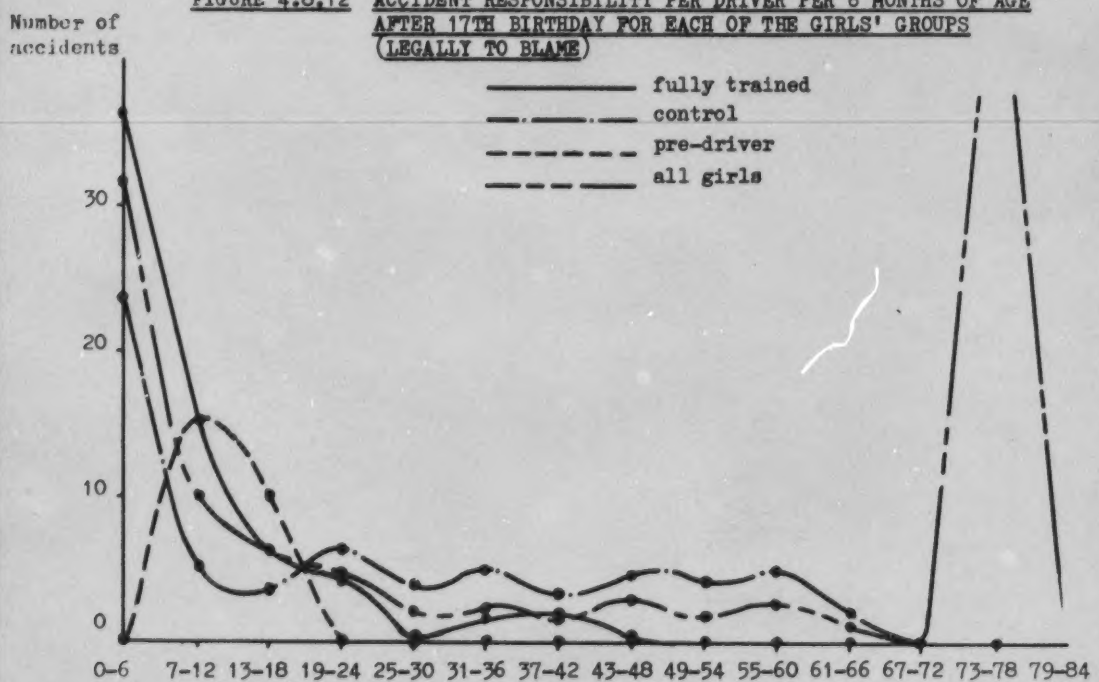


FIGURE 4.8.12 ACCIDENT RESPONSIBILITY PER DRIVER PER 6 MONTHS OF AGE AFTER 17TH BIRTHDAY FOR EACH OF THE GIRLS' GROUPS (LEGALLY TO BLAME)



CHAPTER FIVE AN IN-DEPTH STUDY OF YOUNG PEOPLE'S ACCIDENTS

In recent years, the direction of research has altered as the system concept in the social sciences has gained increased attention. New sciences have arisen, the core of whose notion is 'system'. Until fairly recently, the world was seen as chaos, whereby atoms appeared to represent ultimate reality, with life as an accidental product of physical processes, the outcome of random mutations and survival through natural selection. Now the world is seen as organisation and this trend is marked by the emergence of new disciplines such as cybernetics, information theory, general system theory etc. They are different in basic assumptions, techniques, etc., but they agree in being concerned with 'systems', 'wholes' or organisation. They have been applied in the behavioural sciences because of the increasing dissatisfaction with contemporary psychological theory.

Human factors is one of the newer disciplines which attempts to assess the design implications of behavioural studies so that the improved physical environment offers fewer inducements to unsafe behaviour and protects the road user from the most severe consequences of such behaviour. This approach is gradually gaining acceptance in traffic safety in preference to punitive measures. Likewise, increased attention is being paid to accident countermeasures which seek to influence the driver directly, e.g. propaganda and driver education, which focus on changing individual behaviour so as to reduce exposure to risk or to inhibit actions that are believed to be related to the precipitation of crashes.

The work covered in the name of human factors (e.g. Forbes, 1972) includes research on biographical and physiological characteristics of drivers, factors in sign legibility, methods of presenting information to drivers, skills, judgement and information acquisition in controlling vehicles in traffic, impairment of driver performance due to such factors as stress, driver education and improvement.

There are several areas of concern. The first is that the variables being studied are not always behaviour but some summary variable such as age, sex, socio-economic status, etc., which have little explanatory power. Information collected at such levels is unlikely by itself to provide a close or accurate description of how the observed relationship with accidents came about. Accidents are known to vary in terms of age, sex etc., yet if detailed explanations are required of how such relationships arise, it is necessary to resort to other data or theories.

The <u>main</u> area of concern however is the extent to which such approaches can achieve the stated objective of designing the man/machine/environment task and/or system to fit human capabilities wherever possible. In principle it appears to be a very interesting approach. But most of the analysis is carried out in a vacuum quite distinct from actual accident occurrence. No attempt is made to show how this type of formal model, especially with regard to car following, overtaking, etc., have any predictive validity. Indeed the conclusion is often reached that drivers do a remarkably good job, even in a system where breakdown appears inevitable. The cybernetic (i.e. closed system) model proposed in most research to describe the driver/car/road/environment system equated man with a limited capacity, information processing channel and driving as a negative feedback control system. It seems unlikely that a theory of driving which makes such simplistic assumptions about the driver will be very useful. Such a theory denies the possibility that he may initiate any action and ignores contributions to our understanding of man of the developmental psychologists such as Piaget who showed that man, with respect to the cognitive factor, was not a passive receiver of stimuli coming in from the outside but in a very concrete sense <u>creates</u> his universe, and the view of man as an open, adaptive system, as propounded by the originator of the General System Theory, von Bertalanffy. Driving is only one of a range of social

activities which is influenced by the prevailing social mores which may be antipathetic to safety. Given this uncertainty about the validity of the model, the ability of this type of approach to help the planners and engineers design a system to cater for human capabilities may therefore be very limited.

Despite the claim that this kind of research belongs to the 'systems' sciences, little attention has been paid to the 'systems' literature as such, written over the last 30 years, in particular "General System Theory". (For an introduction, clarifying its scope, see von Bertalanffy, 1973). General System Theory postulates that the formulation and derivation of those principles which are valid for 'systems' in general is possible. Just as physics is concerned with systems of different levels of generality, e.g. special systems for engineering, special laws of physical disciplines such as mechanics or optics, the laws of great generality, e.g. principles of thermodyanics which apply to systems of intrinsically different nature, mechanic, caloric mechanical etc., so principles applying to systems in general are required, irrespective of whether they are of physical, biological or sociological nature. A general theory of system would reduce duplication of effort by providing models that can be used in and transferred to different fields and by safeguarding from vague analogies which have often marred progress. Much of the work carried out in the name of human factors has used inappropriate models for the social sciences and has failed to pay attention to the contributions to science made by other disciplines than that of the research worker.

The ultimate objective of research is to produce countermeasures which would increase safety and this is assumed to be measured by accident records. The word "assumed" is used here since accidents appear to constitute an indirect or negative measure of safety - safety in other words is measured by the results of its absence. An accident may be defined as certain types of outcomes of a collision between two objects in the road transport system which will result in damage to property and/or injury to a road user. Thus accidents are defined by their outcomes rather than their antecedent behaviour. They belong to the wider class of collisions. Various factors such as energy absorbing bumpers, seat belts, efficient ambulance services, an unoccupied vehicle may in fact prevent a collision from being classified as an accident, because they reduce the consequences of such a collision.

Since the assumption is made that unsafe practice on the part of the road user may lead to an accident, these considerations lead to the use of collisions rather than just accidents as criteria for safe practices. Even this criterion cannot be viewed as a representative sample of safe practices in a study concerned with the behaviour and activities of a driver on the road, but rather as an intermediate criterion for the ultimate criterion - namely safe, i.e. risk free, driving practices.

One of the problems of designing accident countermeasures is that they are designed to achieve specific behavioural objectives and yet are not evaluated in behavioural terms since accident records do not constitute behaviour. An interesting study of the use of transverse yellow bar patterns on the roads to influence the driver's perception of speed (Irving, 1973) will permit such an investigation to be made between the accident countermeasure, the specific behavioural objective, i.e. reduction in speed, and the effect on accidents. Rumble strips, alternate rough and smooth road surfaces which produce a loud rumble and some vibrations when driven over, are a possible means of alerting and slowing traffic on roads carrying fast moving traffic. Preliminary results showed that on one installation 50m from a junction the proportion of cars travelling at over 64 km/hr was reduced from 21 per cent to 7 per cent (Watts, 1973). By means of in depth accident studies, attempts are being made to assess which aspect of the road configuration providing information for the drivers was misleading the drivers and thereby resulting in accidents.

Most of this work is characterised by little explicit theoretical discussion, but nevertheless the focus of interest on the modification of driver behaviour by manipulating the information received from the road environment is paramount.

The conclusions reached in our own studies (Raymond et al, 1973; and Shaoul, 1975) suggest that where the task of modifying driver behaviour is seen as one of affecting the attitudes, skills and knowledge of the driver directly, by either propaganda or education, and where the relationship between them and accidents is not known to be a causal one, the likelihood of achieving, or even being able to measure, a substantial increase in safety, is limited.

The only type of changes whose outcomes we can be sure of measuring are changes in our physical environment. This implies studying the underlying structure of the road/driver system to see how it affects the manoeuvres a driver has to make. This represents a departure from previous research which has attempted a formal analysis of the driving task. Most analyses have been specifically concerned with but one facet of driving.

Such a procedure implies the formulation of a model in the sense of a set of interrelated variables that include the driver, the vehicle and the environment. It could take the form of comparing the structure of two different road systems, e.g. the USA and UK, to see how the road system, economic system etc., affect the imperatives to alter speed and direction and consequently affects accidents. It soon becomes clear by comparing different road systems that it is necessary to look at the road system within other systems, e.g. other transport systems, economic and social systems etc., etc. Constraining the task of the human to that of guiding and controlling the vehicle may give greater feasibility to the technical job of understanding the capabilities required to operate a vehicle efficiently and safely, but it overlooks a number of important determinants of the way the car is used in our society.

Another approach in which we are currently engaged at the University of Salford, involved, as part of a study of the relationship between training and young people's accidents, assessing by various means the driving performance of 300 young drivers several years after qualifying as a driver. One of these was an observation check list. This method involved noting whether or not a driver carried out the prescribed sequence of activities for negotiating a particular hazard at a particular point along the route e.g. a right turn onto a major road, straight on through traffic lights. Some work has already been carried out to assess its internal and external validity (Shaoul, 1974; and Shaoul, 1975).

Since this method of observing driver behaviour consists of noting what happens for each road configuration along the 25 mile route, rather than of judging the safety with which it was carried out, a complete record is available of 300 drivers. So far, the data have only been analysed for the groups as a whole. It is proposed to look at each individual drive and note each person's departure from the average. This examination of behaviour with respect to the advised procedures permits us to find out the use made by drivers of the advised procedures as laid down by the Highway Code and Driving Manual.

On the one hand, widespread failure to carry out particular procedures e.g. looking in the mirror before slowing down at a 'stop' or 'give way' sign, would tell us a great deal about the way the road design structures the driver's behaviour. For example, drivers are required to look right/left/right before driving through traffic lights on green. From our observations, at most traffic lights, less than one third of the drivers do so. However, for a few traffic light controlled junctions, this figure is very much higher. This usually occurs when the junction is of a type other than a crossroad (i.e. four exits). Individual failures to carry out a particular sequence which is

carried out by the overwhelming majority of drivers would yield useful information about individual drivers. On the other hand, if certain types of road configurations regularly produce activities on the part of the road user over and above those required by the advised procedures, this would go some way towards indicating where and in what circumstances the procedures are deficient.

The aim is to build up a compound profile for each driver which could then be related to all the available data regarding his experience, exposure to risk and accident record, in an attempt to validate the usefulness of the advised procedure. In addition, an attempt will be made to relate these observations with recorded accidents of the general population along this route. It is rare to have such a complete record as it relates to a driver's actions with respect to a particular route (as opposed to a series of judgements which are not fixed to particular points on the road network). Such an analysis could be of great use to those whose concern is the training of drivers and those whose concern it is to improve the physical environment so that it offers fewer inducements to unsafe behaviour. This should provide us with information based upon the activity of drivers as currently practised and enable us to see how the road designs structures individual behaviour.

Although the traffic engineers have recognised this implicitly in their work on improving traffic flow by altering the road, changing its layout, controlling the drivers by means of traffic lights, the pedestrians' activities by means of barriers at corners, pedestrian crossings etc., this has not always been explicitly or even implicitly realised by those concerned with traffic safety.

5.1 A taxonomy of accidents

The previous chapter has attempted to assess the effects of several variables such as training, age, experience, mileage and sex of the driver on accident frequencies. The major fact to emerge was that the driving task became easier, as measured by the absence of accidents as practice increased. However, even these factors accounted for less than 20% of the variation in accident frequency.

As has been stated before, collisions or accidents are not homogeneous events with respect to antecedent behaviour but only with respect to outcomes of a wide range of behaviours. Therefore since the objective of driver education was to influence behaviour, it follows that these criteria, namely accidents, should be looked at from the point of view of behaviour. This implies looking more closely at the attendant circumstances of the accidents to see what they can tell us about the nature of the driving task, the different components of the driving task, their different levels of complexity and the implications for training.

Although information is needed about a wide range of factors which might conceivably transform the activity of driving into a collision with another road user or object in the road/traffic system, in practice data collection has to be restricted to those factors which the driver is able to recall with some accuracy some time after the event. The choice of information to be collected was not dissimilar to that collected by the Police. This had the advantage that it would be possible to examine the extent to which the accidents reported by the sample are representative, firstly of all young people and secondly, of the population as a whole.

Data were collected from the sample about their accidents by means of a questionnaire (Appendix 3.3.2), (an explanation of the terms is given in Appendix 3.3.5). Table 5.1.1 shows the frequency and percentage frequency distribution of the boys' responses to the questions asked on the accident description form. Table 5.1.2 shows similar information for the girls' groups. For each group, the frequency distribution is in the left hand column and the percentage frequency distribution is shown in the right hand column. In addition the frequency and percentage frequency distribution for the whole sample is also shown.

In principle, several different kinds of accident classifications could be compiled which might clarify the different aspects of the driving task. The first one relates to car handling and requires such information as the number of cars involved in the accident, the type of manoeuvre the driver was carrying out, the type of car and how much he had driven it prior to the accident etc. A second classification relates to the physical road structure and requires such information as the kind of road, speed limit, road configuration, road surface etc. A third classification would include dynamic factors such as the presence of other traffic and pedestrians; a fourth, informational factors such as traffic signals, road signs and road markings etc.; a fifth relates to the condition of the driver with respect to his knowledge of the road and car, fatigue, whether he had been drinking, the purpose of his trip etc. Lastly, factors external to the road/car/driver system might be considered. These could include weather, time of day, visibility and the presence of any objects not part of the driver/car/road/traffic system such as obstacles on the road. Figure 5.1.1 lists all the data collected on the accident description form as it relates to the attendant circumstances of the accident (rather than the outcomes of the accident) and assigns each piece of information to the six systems noted earlier. It can be seen that many of these factors could be assigned to several of these systems.

The following analysis will consider each of these types of interaction of the different factors within the system separately, although a certain amount of overlap is inevitable. An attempt will be made to compare the groups and relate such differences as are observed to their exposure to risk and different patterns of interaction with the car/road system as noted in an earlier report on driving practices (Shaoul, 1975). However such a comparison does present difficulties since it relates to data collected at two different points in time, i.e. at the time of the accident and at the last contact in the follow up study programme in 1974. In addition, since this is only a preliminary analysis of the frequency distributions of the answers to the questions relating to the attendant circumstances and no cross-tabulations or correlational analysis of the data have as yet been done, it is not clear the extent to which apparent differences are accounted for by other factors, e.g. experience and equivalences are accounted for by the confounding operation of other variables. Thus, this analysis should be viewed as only an explanatory study.

The subject of driving practices or "exposure to risk" is one which has attracted considerable attention in terms of the number of studies which attempt to assess its relationship to accidents (Burg, 1973; Campbell, 1972; Carroll, 1971, 1973, 1973; Chapman, 1973).

"Exposure to risk" is viewed as the number of occasions offering the possibility for involvement in accidents, and in practice is usually defined in terms of the annual mileage driven, although the feeling is growing that the qualitative as well as quantitative aspects of exposure to risk should be examined. The literature is not characterised by an explicit explanation of the relationship between safety and exposure, what the exposure to risk data are supposed to mean, and the probability of incurring hazard. The focus of attention on the exposure to risk data is on the contribution they can make to predicting the number of accidents, rather than as behavioural indices of safety in their own right.

The assumption is made that accidents are a result of drivers' actions. In the absence of tests of driver behaviour, estimates of weekly and annual mileage may be seen as the sum of the driver's actions over a particular period - albeit a very difficult quantity for drivers to estimate reliably. Since driving is itself an unsafe practice, total mileage, as a summary variable, provides an index of safety. Insofar as mileage describes the driver's actions, he is at risk or presents a risk to other people the whole time he is

behind the wheel. Here mileage is used for an approximation for the time spent driving, yet clearly each mile is not equal with respect to the time taken to cover the distance or the type and number of drivers' actions.

By driving, a driver exposes himself to risk i.e. he incurs the possibility of unfortunate consequences. In this instance we are only concerned with one incidental effect of driving, but others are of course possible. Insofar as an event is possible, it implies that it is subject to some natural laws. The determination of such laws would show when collisions are inevitable. For example, given the speed, time, spatial dimensions, direction etc., it would be possible to predict whether an accident would occur. But it can be seen, given that there is not a single factor which is directly responsible for the occurrence of the accident, that there is a great deal of uncertainty in determining the occurrence of such an event. Since the scientists cannot specify in sufficient detail when such events are inevitable, recourse is had to such concepts as mathematical probability.

The science of statistics is sometimes conceptualised as the study of variation since it provides techniques for the exploration of variation in the events of nature, for the making of inferences about the causal circumstances which underlie that variation and for generalising from the particular to the population. One of the most powerful techniques is that of mathematical probability which had its origins in games of chance. This theory of probability defines the probability of an event as the relative frequency of the event resulting from an infinite number of trials. It is a theory based on the system of observing the outcome of a vast number of trials or events. Thus it is heavily dependent upon the method of observation and is not equipped to deal with simple events. "Observing" in the context of accidents refers to the methods of police reporting which may vary for many reasons both across time and through time. Trials, in the context of road safety, refers to driving, which likewise cannot be viewed as a very similar task either through time (i.e. over the last eighty years, day or night driving) or across time (e.g. motorway v urban driving). Since for the individual driver, an accident is a rare event, probability theory is not likely to provide an adequate prediction of his likelihood of being involved in an accident. Mathematical probability assumes that probability is constant for each trial. However in the context of accidents, the probability of being involved in an accident has been shown to decline as the number of trials i.e. mileage increases. That is, to use the terminology of mathematical probability, the die becomes more biased with use and consequently the probability of the different outcomes of throwing the die on the one hundredth occasion is not likely to be the same as the probability on the first occasion. Thus it is doubtful the extent to which models based on probability theory are useful. At best, the statistical concept of probability is only a way of observing reality not for determining it. Insofar as the models fit to any degree at all, this is only because they are isomorphic in form. They do not have the content to explain anything. It is difficult to see how they could even show where to look for the cause.

Since driving is itself the sum total of numerous tasks, the concept of exposure to risk implies different probabilities of accidents for different components of the driving task, e.g. right v left turns. In addition, the probability of accidents is known to vary with the type of road, weather conditions, degree of illumination, i.e. the probability of being involved in a collision is not therefore a fixed constant in relation to mileage. The term accident itself belongs to the wider class of unsafe practices which may result in near-misses or collisions and is only distinct from them with respect to outcomes (e.g. injury and extent of damage) which are known to be related to seat belt usage, medical services, interior of the car design etc. Insofar as human beings are adaptive organisms, it follows that exposure to risk i.e. driving, provides learning experiences whereby the driver gains practical

acquaintance with the various tasks of driving. This is usually termed as gaining experience, meaning that the driver becomes more skilled at the task. (The concept of skill implies that performance improves with skill). This in turn implies that the probability of being involved in an accident declines as exposure to risk increases. Thus we are in the contradictory position of saying that as exposure to risk increases, exposure to risk decreases. This is resolved by showing that the term "exposure to risk" is used in two different ways, in the first case as total mileage and in the second as the probability or amount of risk. Thus exposure to risk is the probability of being involved in an accident and this is not independent of previous driving.

So it can be seen that "exposure to risk" is not usually used in the sense of the probability of having an accident but as the number of trials or events in which such an event might occur, from which, knowing the actual number of accidents which occurred, the relative frequency of probability of having an accident can be predicted.

Thus, if the term is to have any meaning, exposure to risk cannot simply be equated with total mileage. Total mileage is the sum of a large number of different types of events and practices. Exposure to risk should therefore be so quantified to include all those driving practices which are known or thought to be related to safety, in order to ascertain their relative safety, and to assign a quantitative value to the hazard. Yet the use of this term (hazard) also presents difficulties. It is assumed that some road or traffic configurations present a hazard. But anything can present a hazard i.e. some injury to a person, e.g. a lamp post on the pavement might suddenly give way, obstruct one's view or be knocked down by another road user. Thus it is difficult to restrict the boundaries of the source of hazard to the driver, car, road, traffic system. The problem is then to specify the various ways the different elements in the system may constitute a possible source of danger.

Most of the studies on exposure to risk use multiple regression techniques to assess the relative weight of each of the exposure to risk variables to the total number of accidents. Yet the logical relationship of these variables with the number of accidents is not made clear. For example, the percentage of night or motorway driving can only predict, at best, the number of night or motorway accidents. It will only indirectly affect the total number of accidents. To give an example, if the total mileage of the group is one million miles, ten per cent of which has been driven on motorways (i.e. 100,000 miles) and the accident rate per mile travelled for the population as a whole is one tenth of that on other types of roads, the contribution of motorway driving to the total number of accidents for the sample could be expected to be as little as one per cent. Even if 50% of driving took place on the motorways, the contribution to the total number of accidents would be no more than 10%. Thus it is not surprising that studies of exposure to risk obtain statistically significant but to all intents and purposes, valueless R^2, i.e. only a very small proportion of the variation is explained by these variables. In any event, the risk or probability of incurring hazard is never defined. The studies do not show explicitly what the risk is, e.g. in night driving, does the risk emanate from the darkness, i.e. the distinctive property of night as such, or from the characteristics of the people who drive at night who may have drunk more or be more tired etc., or from some combination of both?

In an earlier study (Shaoul, 1975), the exposure to risk variables have been used in their own right as criteria for evaluating courses in driver education. This was justified since these variables are known to be related to safety as reflected in accidents. If the assumption is made that the objective of driver education is to teach safe driving practices, then it follows that its effect on such practices as the extent of night and motorway driving, seat belt usage and mileage must be examined. Total mileage poses a difficult problem. In the case of night driving, motorway driving and seat belt usage,

in the light of current knowledge the behavioural objectives of driver education may be explicitly stated as those of reducing the first as much as possible and increasing the second and third. However, although in these cases the objective may be stated in general terms, it is not clear whether, for example, in the case of seat belts, it can be said to have been realised if people only use seat belts for some, rather than all, of their journeys. The case of total mileage is not so clear cut. Mileage does not constitute behaviour and driver education is concerned to influence behaviour. Insofar as driving is itself an unsafe practice, perhaps the aim should be to reduce total mileage to a minimum. On the other hand, since the amount of danger decreases as experience increases, and since driving (i.e. total mileage) is the declared objective of those learning to drive and is a necessity for many people, such an aim is hardly very consistent with the objective of teaching people to drive. The purpose therefore of examining the effect of driver education on mileage is not that it is a criterion of driver education but that it is known to be related to accident involvement.

Other variables, often included under the term exposure to risk, such as the type and age of the vehicle usually driven, journey length, purpose of driving and whether or not they drove with passengers, will also be examined. Again, the purpose is not in this case that they were related to the objectives of driver education and therefore can be used as objectives but rather that they are driving practices which are thought to be related to accident involvement.

Ultimately, however, it is the nature of the relationship between such driving practices which are, after all, only a sample of their pattern of interaction with the car, as a whole, and accidents, which is of crucual importance. Only if these are found to co-exist with accident-free driving can they be used as criteria of safety. Such valid patterns of interaction which correlate highly with safe driving make it possible to establish empirically the relevance of the contents of educational programmes and their contribution to the desired objective. In practical terms, this implies, for example, always wearing a seat belt when driving will result in fewer injury accidents. The relationship between a person's driving habits and his involvement in certain types of accident has not been examined in this way before. A clarification of the issues involved could enable a more precise formulation of objectives for driver education. If, on the other hand, strict adherence to the guidelines laid down in the course still results in accidents which these sequences were designed to avoid, then the relevance of these procedures must be re-examined.

If these practices which are laid down are valid, there will be a positive relationship between adherence to them and accident free driving, and driver education teachers must emphasise those practices which the evidence suggests are not being obeyed. Evaluation of driver education may be concerned with the degree to which its students are consistently carrying out such practices.

Even if some of these practices are not valid, i.e. do not result in an improvement with respect to safety, evidence suggesting that driver trained students are interacting with the car in a different way to that of their untrained counterparts would confirm the usefulness of this method of instruction, since positive transfer has taken place between the initial training experience and subsequent practical experience on the road, albeit of a potentially harmful nature. The same set of observations for the accident-free drivers (in the relevant situation) suggests which are the critical practices. The problem then becomes the one of redesigning or modifying the particular course content appropriately and evaluating the course, in terms of driving practices all over again.

This theory of accident causation assumes that it is the way, in part, that the driver interacts with his car, e.g. how much he drives, when, how

FIGURE 5.1.1 THE ATTENDANT CIRCUMSTANCES OF THE ACCIDENT AND THE DRIVER/CAR/ROAD/TRAFFIC SYSTEM

	Vehicle characteristics & car handling	Physical road features	Dynamic factors	Informational factors	External factors	Condition of driver
vehicle usually drove	✓					✓
vehicle size/type	✓					
vehicle engine size	✓					
vehicle age	✓					
purpose of trip						✓
number of other vehicles	✓		✓			
type of other vehicle			✓			
age when accident happened						✓
time of day					✓	✓
know the road		✓				✓
speed of own vehicle	✓					
speed of other vehicle (1)			✓			
speed of other vehicle (2)			✓			
within 15 miles of home		✓				✓
kind of road		✓				
speed limit		✓				
light conditions					✓	
weather conditions					✓	
road conditions					✓	
road surface		✓				
road configuration		✓		✓		
own manoeuvre	✓		✓			
other manoeuvre (1)			✓			
other manoeuvre (2)			✓			
other manoeuvre (3)			✓			
pedestrian			✓			
seat belt: driver						✓
seat belt: passenger						
drinking and driving						✓
contributing factors		✓	✓		✓	
lapse of attention						✓
length of time had been driving since passing the test						✓
mileage						✓
own assessment of responsibility						
assigned " " "						
accident type	✓	✓	✓			

much he exposes himself to risk, which will determine whether or not he is involved in accidents. This theory does not negate the importance of safety engineering in improved standards of car and road and road design and the enormous contributions that engineers can make. This is, in fact, likely to be the largest single factor in accident reduction. It does, however, imply that if these benefits are to be maximised, the driver educator must continuously be revising his taxonomy of hazardous conditions e.g. alcohol and driving, drugs and driving, and series of practices designed to overcome these hazards as the conditions themselves are changing.

Thus it can be seen that this model of driver education and its evaluation is a continuous heuristic process which, in turn, provides a means of improving driver education, by altering its content or re-ordering its priorities and a means of evaluating its contribution to accident-free driving. It is an approach which seeks to integrate many of the different types of research aimed at reducing road accidents.

5.2 The car/driver system

The car/driver system refers to the kinds of actions the driver is able to do with his car and these are chiefly the ability to alter speed and direction. However, this is strictly limited by the design of the automobile and within that group, the design of the particular type of car. Those factors which give some indication of the interaction between the driver and his car are listed under the appropriate headings in Figure 5.1.1, and are discussed in this section.

To a certain extent, the driver's actions will be affected by the degree to which he is familiar with his car's capabilities. In an attempt to ascertain the part played by this in safe driving, all drivers involved in an accident were asked whether the accident occurred while driving the car they usually drove. Table 5.1.1 shows that lack of familiarity with the car at the time when the accident occurred was associated with 11% of the boys' accidents. Within the boys' sample, there was little variation. Only 6% of the girls' accidents occurred while the girls were driving a different car to the one they usually drove. This was more likely to be a factor in the pre-driver trained group than in any of the other groups. Lack of familiarity with the car was more frequently associated with the boys' accidents than the girls' accidents.

It is difficult to ascertain the degree to which lack of familiarity with the car is important since it is not known the extent to which the sample as a whole drove cars other than their usual one. In any event, the girls were less likely to own the car they usually drove and drove fewer miles per week than the boys, yet lack of familiarity with the car was reported less often by the girls than the boys. For the most part, accidents occurred in the car they usually drove as could be expected on the basis of mileage alone. It seems likely that in relation to the mileage driven in the 'unfamiliar' car, that the number of such accidents is higher than in the car they usually drove.

When the type of vehicle which the boys' sample were driving when the accident occurred is considered, it can be seen that about 40% occurred in medium, i.e. 5 seater, family saloon. Just over one third occurred in a small car. The differences within the boys' sample are very small. When the girls' sample is considered, it can be seen that accidents in medium and small cars also accounted for the majority of accidents. No accidents took place while driving a van and very few a sports car. When these figures are compared with the percentage frequency distribution of types of vehicles usually driven by those drivers who drove in the seven days prior to being questioned, at the end of the follow up studies, they are, broadly speaking, very similar. In addition, it was found that the girls drove smaller cars than the boys. Thus this difference between the samples with respect to type of car involved in

the accident is to be expected. However, it should of course be pointed out that these comparisons are made between data collected at different points in time. If this is a valid comparison, then it would appear that no one type of vehicle is particularly difficult for a young driver to handle safely and that the medium family saloon car is most frequently involved in an accident because that is the type of car that is most frequently driven by the sample. The correlation analysis of the data relating to driving practices (Shaoul, 1975) did not reveal any relationship between the type of car and mileage. There is therefore no reason to think that a particular type of car is being driven more miles per week than any other type. Thus the handling characteristics of different sizes of car do not appear to be a major factor in these accidents.

The engine size of the cars involved in accidents were then compared. It can be seen that in at least half of the boys' accidents, the engine size was in the range 1001-1500 c.c. Engine sizes of less than 1001 c.c. accounted for about one third of the boys' accidents. The differences within the boys' sample are very small. When the girls' sample are considered, again the 1001-1500 c.c. engine is the most frequently reported size, followed by the 0-1000 c.c. engines. There are however significant differences within the girls' sample. The control girls were more likely than the other groups to have been driving a small engine car when the accident occurred, and less likely than the other groups to have been driving a 1001-1500 c.c. engine car. i.e. the distribution of accidents was evenly split between the two sizes of car engine. When the engine sizes of the cars the girls' groups usually drove were compared, it was noted that the control girls were slightly, but not significantly so, more likely to be driving smaller engined cars than the other groups. Thus these results are not entirely unexpected. However, what is surprising is that boys' and girls' accident data are remarkably similar, yet the girls were more likely (and this difference was significant) to be driving less powerful cars than the boys. Thus it would appear that in relation to the type of car they were driving in 1974, the girls were more likely to be driving more powerful cars when the accident occurred. This would suggest that different types of cars present different problems for the girls than for the boys. It would tend to imply that the girls had greater difficulty controlling speed in the more powerful cars than the boys.

The relationship between the age of the car and accident involvement was also examined in order to establish whether the age and therefore the condition and design of the car affected the driver's activity and accident involvement. The frequency distribution of the age of the car involved in the accidents is shown in Table 5.1.1. There were no significant differences between the various groups. In general, the distribution of car age was evenly spread between all age ranges. The distribution was very similar to that of the cars the boys, who usually drove, drove in 1974. Similar findings were observed for the girls' sample. Thus at this stage, there is no reason to suppose that accident involvement and the age of the car are in any way associated for this sample of young people. In the absence of more detailed information about the condition of the car and the design changes (in car handling characteristics), age of the car provides surrogate information about these factors. Insofar as this is valid, there is no evidence that these were important factors in accident causation.

It can be seen from Table 5.1.1 that most (about 75%) of the boys' accidents involved at least one other vehicle. There was some variation within the boys' sample but this was not statistically significant at the 5% level. Table 5.1.2 shows the proportion of the girls' accidents that were single vehicle accidents. About thirty percent were single vehicle accidents, i.e. a slightly higher proportion than that of the boys. Within the girls' sample a higher proportion of the fully trained girls' accidents were single vehicle

accidents and this difference was statistically significant at the 5% level. Thus training is, in the girls' case, associated with a different type of accident. However since the trained girls differed from the other groups with respect to mileage and the boys had driven more than the girls, it seems likely that these differences are due to variations in experience rather than training, i.e. the relationship between training and type of accident seems more likely to be due to an association with a third variable, namely mileage, rather than a causal relationship.

The assumption is made that in single vehicle accidents, that some error in car control is involved. It would appear from this, that the trained girls had greater difficulty in car control than the other groups, and that the girls found this aspect of the driving task more difficult than the boys did. Nevertheless, despite the fact that this sample of accidents includes very minor collisions and parking accidents, and is taken from the most unskilled phase of their driving career (the first few years after learning to drive), it is the presence of other traffic rather than car control and pedestrians which presents the greatest difficulty, as reflected by the frequency of accidents. That is not to say, of course, that two or more vehicle accidents do not represent lack of car control.

Data collected about the driver's manoeuvre immediately prior to the accident could provide some information about the difficulty experienced by these young drivers in controlling their cars. It can be seen from Table 5.1.1 that in the boys' sample, the most frequent activity on the part of the driver was "making normal progress", that is, not carrying out any particular manoeuvre. This is of course to be expected since by far the greatest proportion of the driver's time is spent "making normal progress". The second most frequent category involved the driver turning or waiting to turn. The other important categories are those of overtaking either a moving, held up or parked vehicle and manoeuvring at slow speed. The latter category at least provides some indication of the degree to which car control is a difficult driving task. But in the other cases, the extent to which car control is important is not clear. There is some variation between the groups but not sufficient to attain statistical significance.

Table 5.1.2 shows the frequency of the girls' manoeuvres immediately prior to the accident. The most frequent manoeuvre was that of turning, followed by the slow speed manoeuvres and "making normal progress". There was some variation within the girls' sample, with the experimental girls reporting a higher proportion of slow speed manoeuvring accidents. These differences, although not statistically significant, are consistent with the fact that the fully trained girls reported a higher proportion of single car accidents. This confirms the previous finding that the fully trained girls had more difficulty with car control than the other groups and that the girls experienced more difficulty with car control than the boys did.

There are several possible explanations for differences in car control accidents within the girls' sample and between the boys' and girls' samples. It may be that they were more conscientious about reporting every bump and scrape than were the other groups of girls or than the boys, thereby swelling the proportion of single vehicle, slow speed manoeuvring accidents, since most of the very minor accidents were turning manoeuvres off the public roads. Alternatively, since the chief way in which the groups differed was in total mileage driven, it may be that these accidents are associated with lower levels of experience than the multi-vehicle accidents. This seems a more likely explanation since if it were simply a reporting bias, one would expect this bias to show up in other ways and so far, this has not been observed.

Since the girls were usually turning or carrying out a slow speed manoeuvre when the accident occurred, it may be argued that it is changing direction

that is the most difficult part of car control in the early stages of learning to drive (as measured by accident frequencies). It would appear to be more difficult than speed control. However, as experience increases, there is evidence to suggest, from the boys' accident data, that speed control relative to the conditions becomes more important.

An accident situation classification was compiled in order to clarify the nature of the driving task and assess the difficulties in carrying out different aspects of the task, taking into account various bits of information reported in the accident description form. First of all accidents were subdivided on the basis of the number of vehicles or road users involved in the accident. There were thus four categories; single moving vehicle accidents, two or more moving vehicle accidents, pedestrian accidents and lastly a fourth category for other accidents. This was important since there were so many trivial, manoeuvring accidents. Each broad category was then further subdivided into type of manoeuvre. It seemed likely that each subdivision would contain accidents which when further analysed would be associated with a similar degree of assigned responsibility for the accident. One would not expect this in all cases.

The purpose of the classification is to pinpoint any type of accident or error which is particularly common so that more emphasis might be placed on instruction for dealing with this type of situation, and thought given to new and more appropriate ways of conveying this information to learner drivers. Too little is known not only of what needs to be taught but also the relative emphasis to be placed on different aspects of driving instruction and those aspects which learners find difficulty in appreciating and/or applying. By examining more closely the underlying features of these accidents, it may be possible to design a syllabus which will be more effective in reducing accidents. Although these accident types are found among inexperienced drivers, it may be that the same types are also committed by more experienced drivers at greater speed and with graver consequences, and therefore such a classification may be of value in highlighting errors and potential accident situations.

Table 5.1.3 lists the different types of accident situations. Each of the accidents was assigned to one of these categories. In most cases, this was straightforward. Whenever it appeared that an accident might be assigned to one of several categories, the assignment was made on the basis of what the driver in the sample was doing. This was reasonable since the purpose of the classification is to discover which types of manoeuvres the students in the research project found the most difficult.

Table 5.1.4 shows the frequency and rank order of frequency of accidents assigned to each category for each of the boys' groups. Table 5.1.5 shows similar information for each of the girls' groups. When only the boys' sample is considered, their most frequent types of accident involve at least one or more turning vehicles, single vehicle accidents on the public roads and rear end collisions, with a stationary vehicle or one that was slowing down. There was some variation within the boys' sample but not sufficiently great as to attain statistical significance. The turning accidents where two or more vehicles are involved are too heterogeneous a category to draw any conclusions about car control. However the prevalence of the rear end collision, (with the driver in the sample in the car) imply an inability to control speed in relation to stopping distance. The single vehicle accidents, both on and off the public roads, certainly testify to the lack of car control and when combined, provide the largest single category.

The girls' most frequent type of accident was also the two vehicle accident, one or both of which were turning. The next two most frequent categories, which combined exceed the number of turning accidents, involved

only one vehicle manoeuvring off the public roads and on the public roads. Thus clearly, the role of car control is crucial in the girls' accident involvement. The variation between the girls' groups was not sufficiently great as to achieve statistical significance at the 5% level. When the boys and girls are compared, the distributions and rank order of frequency differed significantly, thereby confirming the findings noted earlier, namely the greater difficulty experienced by the girls in handling the car. Speed control, as measured by the frequency of rear end collisions was not as important for the girls as for the boys.

The evidence presented in this section suggests that in so far as the measures used are valid indices of car control, car control is not the major factor in accident causation. There is little evidence that training given in the classroom has any effect on car handling and given the nature of the differences observed within and between the boys' and girls' samples, this seems to be one aspect of the driving task that is learned fairly quickly and is mastered sooner than other aspects of the driving task, e.g. driving in traffic. In so far as there are slight differences within and between the boys' and girls' samples and that these are related to experience, it would tend to imply that this aspect of driver behaviour is modifiable. Two aspects of car control have been identified, that of changing direction and speed. It would appear that changing direction is more difficult for the novice driver than the experienced driver and as experience increases, adapting speed to the road and traffic conditions becomes more difficult.

5.3 The physical road features

The physical road features determine to a large extent the driving task. The information collected from those drivers who had been involved in an accident which indicates the way the road system affects the imperatives to alter speed and direction are listed under the appropriate heading in Figure 5.1.1. The structure of the road system affects the manoeuvres a driver has to make. A comparison of the road systems of the UK and USA clearly illustrates the different nature of the driving task in the two countries. In the USA the roads are very wide, with room for several streams of traffic. The roads are straight and where a change of direction in the road is required, this tends to be effected by a curve rather than a bend. Intersections, even in residential areas are rectangular, i.e. crossroads or a T junction, Y junctions, staggered junctions or junctions with more than four exits are far less common than in this country. Most roads, other than residential roads, are freeways with limited access although they are not uniform in design with respect to exists and entrances.

The implications of these differences in road design for the driver are numerous. There are far fewer decision points since there are fewer traffic lights, roundabouts and changes in road width. Thus lane changing is less frequent than in this country. Because of the provision of off-street parking, parking presents fewer problems both to those trying to park their cars and to other road users. Because in many towns, the roads are laid out on a grid system, there are extensive parallel one-way street systems, and consequently fewer changes of direction are required. There are fewer confrontations with on-coming traffic because of the wide nature of the roads. Opposite streams of traffic are often separated by studs or barrier, and of course, the separation of traffic travelling in different directions is one of the essential features of freeway design. In addition to the separation of traffic travelling in a different direction, the driver is also separated from other road users, spatially, in the case of cyclists, and both in spatial and in temporal terms from pedestrians. The pavements are wide and shopping centres etc. are so designed that pedestrians rarely need to cross the road at anywhere other than an intersection where the two types of road user are separated, temporarily, by means of traffic lights. Crosswalks are provided

TABLE 5.1.1

BOYS ACCIDENT DESCRIPTION FORM (% Accidents)

		Pre-driver		Control		Full		Simulator		Total	
Number of accidents		98	%	187	%	149	%	13	%	447	%
Occupation (from driving history questionnaire).	Student	57	58	123	66	89	60	5	38	274	61
	Earning	40	41	64	34	60	40	8	62	171	38
Additional part time or temporary job	Yes	47	48	71	38	73	49	7	54	198	44
	No	45	46	99	53	75	50	6	46	225	50
	No response	6	6	17	9	1	1	0	0	24	5
Vehicle usually drive	Yes	88	90	163	87	137	92	12	92	400	89
	No	10	10	24	13	12	8	1	8	47	11
Type of vehicle	Small car	35	36	65	35	47	32	6	46	153	34
	Medium size	41	42	71	38	73	49	3	23	188	42
	Large	13	13	29	16	17	11	1	8	60	13
	Van	6	6	15	8	8	5	2	15	31	7
	Sportscar	0	3	6	3	3	2	1	8	13	3
	No response	0	0	1	1	1	1	0	0	2	0
Engine size	0-1000 cc	27	28	62	33	46	31	5	38	140	31
	1001-1500 cc	52	53	87	47	82	55	7	54	228	51
	1501-2000 cc	13	13	28	15	17	11	1	8	59	13
	2000 cc and over	6	6	8	4	3	2	0	0	17	4
	No response	0	0	2	1	1	1	0	0	3	1
Age of car	under 1 year	4	4	13	7	19	13	0	0	36	8
	between 1 and 2 years	9	9	13	7	17	11	1	8	40	9
	" 2 3 "	16	16	27	14	15	10	1	8	59	13
	" 3 4 "	10	10	23	12	6	4	0	0	39	9
	" 4 5 "	2	2	15	8	5	3	2	15	24	5
	" 5 6 "	7	7	18	10	11	7	0	0	36	8

		Pre-driver		Control		Full		Simulator		Total	
Age of car (cont)	between 7/6 years	10	10	12	6	14	9	3	23	39	9
	" 7/8 "	6	6	10	5	11	7	1	8	28	6
	" 8/9 "	7	7	18	10	13	9	0	0	38	9
	" 9/10 "	6	6	10	5	6	4	1	8	23	5
	" 10/11 "	9	9	11	6	9	6	1	8	30	7
	11 years and over	11	11	14	7	21	14	2	15	48	11
	No response	1	1	3	2	2	1	1	8	7	2
Purpose of journey	Social	71	72	123	66	102	68	8	15	304	68
	Work	11	11	21	11	15	10	2	8	49	11
	To/from/work/study	14	14	31	17	23	15	3	23	71	16
	Driving instruction	2	2	12	6	7	5	0	0	21	5
	Other	0	0	0	0	2	1	0	0	2	0
Total number of vehicles involved in accident	One	22	22	37	20	38	26	2	15	99	22
	two	65	66	132	71	106	71	10	77	313	70
	Three	8	8	16	9	5	3	0	0	29	6
	four	3	3	2	1	0	0	1	8	6	1
Type of other vehicle involved.	Car	58	59	117	63	83	56	8	62	266	60
	Van	7	7	15	8	10	7	1	8	33	7
	Motorcycle	3	3	4	2	2	1	1	8	10	2
	Lorry	5	5	10	5	12	8	1	8	28	6
	Bus	2	2	4	2	3	2	0	0	11	2
	No response	1	1	0	0	1	0	0	0	0	0
	Not applicable	22	22	37	20	38	26	2	15	99	22
Within 15 miles of home	Yes	69	70	149	80	123	83	11	85	352	79
	No	29	30	38	20	26	17	2	15	95	21
Kind of road	Motroway	2	2	2	1	1	1	1	8	6	1
	Clearway	4	4	0	0	0	0	0	0	4	1
	Dual carriageway	8	8	19	10	8	5	1	8	36	8
	Fourlane road	5	5	27	14	13	9	3	23	48	11
	Three lane road	4	4	12	6	4	3	2	15	22	5
	Two lane road	50	51	80	43	81	54	3	23	214	48

		Pre-drive		Control		Full		Simulator		Total	
Kind of road (contd)	One way street	7	7	8	4	7	5	0	0	22	5
	No lane marking	13	13	20	11	15	10	2	15	50	11
	Dont know	1	1	1	1	0	0	0	0	2	0
	Other	4	4	17	9	20	13	1	8	42	9
Speed limit	30 mph	70	71	138	74	109	73	7	54	324	72
	40 mph	7	7	12	6	6	4	3	23	28	6
	50 mph	1	1	1	1	0	0	0	0	2	0
	60 mph	0	0	1	1	2	1	0	0	3	1
	70 mph	9	9	10	5	9	6	1	8	29	6
	Don't know	7	7	8	4	2	1	1	8	18	4
	Other	4	4	17	9	21	14	1	8	43	10
Light conditions	Dawn	1	1	1	1	2	1	0	0	4	1
	Daylight	53	54	106	57	72	48	10	77	241	54
	Dusk	5	5	24	13	11	7	1	8	41	9
	Dark (unlit)	8	8	11	6	17	11	1	8	37	8
	Dark(lit)	31	32	45	24	47	32	1	8	124	28
Weather conditions	Clear	72	73	129	69	106	71	10	77	317	71
	Rain	18	18	51	27	39	26	3	23	111	25
	Snow	6	6	5	3	4	3	0	0	15	3
	Fog	2	2	2	1	0	0	0	0	4	1
	Severe winds	0	0	0	0	0	0	0	0	0	0
Road conditions	Dry	52	53	114	61	91	61	10	77	267	60
	Greasy	8	8	18	10	8	5	2	15	36	8
	Wet	29	30	47	25	43	29	1	8	120	27
	Muddy	1	1	2	1	0	0	0	0	3	1
	Icy	8	8	4	2	6	4	0	0	18	4
Road surface	Smooth	73	79	148	79	133	89	12	92	370	83
	Potholed	3	3	9	5	7	5	1	8	20	4
	Loose chippings	4	4	7	4	7	5	0	0	18	4
	Cobbled	2	2	7	4	2	1	0	0	11	2
	No response	12	12	16	9	0	0	0	0	28	6

		Pre-driver		Control		Full		Simulator		Total	
At or near	Roundabout	5	5	9	5	5	3	1	8	20	4
	'Y' junction	4	4	9	5	2	1	0	0	15	3
	Junction with more than 4 roads	0	0	0	0	0	0	0	0	0	0
	Private dre/ent/car park.	12	12	21	11	27	18	1	8	61	14
	Staggered junction	3	3	3	2	6	4	1	8	13	3
	'T' Junction	19	19	36	19	35	23	3	24	93	21
	Crossroads	11	11	33	18	19	13	2	16	65	15
	Another type of junction	3	3	2	1	2	1	0	0	7	2
	Pedestrian	5	5	12	6	8	5	1	8	26	6
	Not at a junction	36	36	61	33	46	31	4	32	147	33
Manoeuvre of own vehicle	Making normal progress	30	31	39	21	41	28	5	38	115	26
	Waiting to go ahead but held up	9	9	6	3	4	3	0	0	19	4
	Overtaking a moving or held up vehicle	14	14	28	15	24	16	3	23	69	15
	Turning or waiting to turn right/left	21	21	40	21	33	22	3	23	97	22
	Slowing down or stopping eg at lights	8	8	30	16	16	11	1	8	55	12
	Moving off	3	3	7	4	8	5	0	0	18	4
	Parked	5	5	10	5	3	2	0	0	18	4
	Parking) Reversing) Turning round)	8	8	27	14	20	16	1	8	56	13
	No response	0	0	0	0	0	0	0	0	0	0
Manoeuvre of other vehicle (1)	Making normal progress	14	14	28	15	25	17	4	30	71	16
	Waiting to go ahead, but held up	2	2	5	3	1	1	0	0	8	2
	Overtaking a moving or held up vehicle	9	9	16	9	11	7	0	0	36	8

		Pre-driver		Control		Full		Simulator		Total	
Manoeuvre of other vehicle (1)	Turning or waiting to turn right/left	18	18	34	18	33	22	3	23	28	20
	Slowing down or stopping eg at lights	12	12	20	11	19	13	3	23	54	12
	Moving off	5	5	16	9	7	5	0	0	28	6
	Parked	7	7	9	5	12	8	1	8	29	6
	Parking										
	Reversing	8	8	4	2	2	1	0	0	14	3
	Turning round										
	Not applicable	23	23	39	21	39	26	2	15	103	23
Manoeuvre of other vehicle (2)	Making normal progress	1	1	5	3	3	2	0	0	9	2
	Waiting to go ahead, but held up	1	1	1	1	0	0	0	0	2	0
	Overtaking a moving or held up vehicle	0	0	2	1	1	1	0	0	3	1
	Turning or waiting to turn right/left	4	4	1	1	1	1	0	0	6	1
	Slowing down or stopping eg at lights	1	1	1	1	1	1	1	8	4	1
	Moving off	0	0	1	1	0	0	0	0	1	0
Manoeuvre of other vehicle (3)	Making normal progress	1	1	1	1	0	0	0	0	2	0
	Waiting to go ahead, but held up	0	0	0	0	0	0	0	0	0	0
	Overtaking a moving or held up vehicle	0	0	0	0	0	0	0	0	0	0
	Turning or waiting to turn right/left	0	0	0	0	0	0	0	0	0	0
	Slowing down or stopping eg at lights	1	1	1	1	0	0	1	1	3	1
	Moving off	0	0	0	0	0	0	0	0	0	0
	Parked										
	Parking	0	0	0	0	0	0	0	0	0	0
	Reversing	1	1	0	0	0	0	0	0	0	0
	Turning round										

		Pre-drive		Control		Full		Simulator		Total	
Manoeuvre of other vehicle (3) (cont'd)	Not applicable	95	98	178	98	149	100	121	92	434	97
	Parked	3	3	6	3	0	0	0	0	9	2
	Parking										
	Reversing	1	1	0	0	0	0	0	0	1	0
	Turning round										
	Not applicable	87	89	168	90	143	96	12	92	410	92
Pedestrian	None	92	94	172	92	145	97	11	85	420	94
	Crossing the road at a pedestrian crossing	3	3	6	3	2	1	1	8	12	2
	Crossing the road within 20 yds of a pedestrian crossing	0	0	2	1	0	0	0	0	2	0
	Crossing elsewhere	2	2	5	2	2	1	1	8	10	2
	On the pavement	0	0	2	1	0	0	0	0	2	0
	On the central strip	0	0	0	0	0	0	0	0	0	0
	Boarding or alighting a bus	0	0	0	0	0	0	0	0	0	0
	On the road not crossing	1	1	0	0	0	0	0	0	1	0
Seat belts worn by driver	Yes	25	26	54	29	42	28	1	8	122	27
	No	54	55	97	52	77	52	11	85	240	53
	Not fitted	18	18	31	17	28	19	1	8	78	17
Seat belt worn by passenger	Yes	9	9	27	14	19	13	1	8	56	13
	No	36	37	70	37	45	30	4	31	155	35
	Not fitted	11	11	15	8	23	15	0	0	49	11
	No passengers	37	38	64	34	54	36	5	38	160	36
Drink	No one	85	87	155	83	128	86	11	85	379	85
	Driver	5	5	16	9	12	8	2	15	35	8
	Other driver (1)	3	3	8	4	2	1	0	0	13	3

		Pre-Driver		Control		Full		Simulator		Total	
Drink (cont'd)	Other driver (2)	0	0	0	0	1	1	0	0	1	0
	Pedestrian	1	1	2	1	0	0	0	0	3	1
	Passengers	4	4	4	2	5	3	0	0	13	3
Part of own vehicle hit	Front	47	48	83	44	64	43	7	54	201	45
	Back	21	21	42	22	33	22	2	15	98	22
	Near Side	10	10	31	17	28	19	1	8	70	16
	Off Side	20	20	30	16	24	16	2	15	76	17
	Roof	0	0	1	1	0	0	1	8	1	0
Part of other vehicle hit (1)	Front	29	30	56	30	37	25	3	23	125	28
	Back	22	22	47	25	28	19	3	23	100	22
	Near side	11	11	14	7	15	10	2	15	42	5
	Off side	13	13	26	14	28	19	1	8	68	15
	Not applicable/no response	23	22	44	23	41	26	4	23	112	25
Part of other vehicle hit (2)	Front	1	2	5	3	1	0	0	0	7	2
	Back	2	2	4	2	1	1	1	8	8	2
	Near Side	1	1	0	0	0	0	0	0	1	0
	Off Side	1	1	5	3	0	0	0	0	6	1
	Not applicable	93	95	173	92	147	98	12	92	425	94
Cost of repairing own vehicle	£0	15	15	35	19	33	22	3	23	86	19
	£0-25	26	27	57	30	51	34	2	15	136	30
	£26-£50	15	15	35	19	17	11	4	31	71	16
	£50+ vehicle driven away	15	15	20	11	27	18	0	0	62	14
	£50+ vehicle not driveable	8	8	14	7	6	4	2	15	30	7
	Write off	10	10	13	7	10	7	1	8	34	8
	Don't know	8	8	12	6	5	3	1	8	26	6
	No response	1	1	1	1	0	0	0	0	2	0
Cost of repairing other vehicle (1)	£0	16	16	28	15	23	15	4	31	71	16
	£1-£25	15	15	44	24	24	16	3	23	86	19
	£26-£50	2	2	17	9	15	10	1	8	35	8
	£50+ vehicle driven away	8	8	7	4	9	6	1	8	25	6
	£50+ vehicle not driveable	7	7	9	5	7	5	1	8	24	5

		Pre-driver		Control		Full		Simulator		Total	
Cost of repairing other vehicle (1) (cont'd)	Write off	2	2	5	3	1	1	0	0	8	2
	Don't know	25	26	39	21	31	21	1	8	96	21
	Not applicable	23	23	38	20	39	26	2	15	102	23
Cost of repairing other vehicle (2)	£0	8	8	4	2	3	2	0	0	15	3
	£1-£25	1	1	3	2	0	0	0	0	4	1
	£26-£50	0	0	1	1	1	1	0	0	2	0
	£50+ vehicle driven away	1	1	2	1	0	0	0	0	3	1
	£50+ vehicle not driveable	1	1	0	0	0	0	0	0	1	0
	Write off	0	0	1	1	0	0	0	0	1	0
	Don't know	0	0	7	4	1	1	1	8	9	2
	Not applicable	82	99	169	90	144	96	12	92	412	92
Who paid for repairing own vehicle	Not repaired	17	17	50	27	41	28	4	31	112	25
	You	31	32	63	34	57	38	6	46	157	35
	Your insurance company	11	11	21	11	14	9	0	0	46	10
	The other person	7	7	13	7	13	9	1	8	34	8
	His insurance company	18	18	28	15	16	11	2	15	64	14
	Don't know	11	11	7	4	5	3	0	0	23	5
	Cost divided	1	1	4	2	2	1	0	0	7	2
	No response	2	2	1	1	1	1	0	0	4	1
Who paid for repairing other vehicle (1)	Not repaired	13	13	27	14	25	17	4	31	69	15
	You	7	7	21	11	9	6	1	8	38	9
	Your insurance company	16	16	19	10	13	9	0	0	48	11
	The other person	8	8	15	8	10	7	0	0	33	7
	His insurance company	8	8	21	11	8	5	2	15	39	9
	Don't know	22	22	38	20	41	28	4	31	105	23
	Cost divided	1	1	7	4	3	2	0	0	11	2
	Not applicable	28	23	39	21	40	27	2	15	104	23
Who paid for repairing other vehicle (2)	Not repaired	6	6	5	3	3	2	0	0	14	3
	You	0	0	4	2	0	0	0	0	4	1
	Your insurance company	0	0	1	1	0	0	0	0	1	0

		Pre-driver		Control		Full		Simulator		Total	
Who paid for repairing other vehicle (2) (cont'd)	The other person	0	0	1	1	0	0	0	0	1	0
	His insurance company	0	0	5	3	0	0	0	0	5	1
	Don't know	3	3	1	1	1	1	1	8	6	1
	Cost divided	0	0	1	1	0	0	0	0	1	0
	Not applicable	89	91	169	90	145	97	12	92	415	93
Injury to self	None	93	95	175	94	143	96	11	85	422	94
	Slight injury	3	3	11	6	5	3	2	15	21	5
	Serious	1	1	0	0	0	0	0	0	1	0
	Very serious	1	1	0	0	0	0	0	0	1	0
Injury to other person (1)	None	71	72	145	78	109	73	9	69	335	75
	Slight	7	7	14	7	4	3	1	8	26	6
	Serious	4	4	0	0	1	1	0	0	5	1
	Very serious	2	2	1	1	1	1	1	8	5	1
	Fatal	0	0	0	0	0	0	0	0	0	0
	Don't know	0	0	1	1	1	1	0	0	2	0
	No response/not applicable	14	14	26	14	33	22	2	15	74	17
Injury to other person (2)	None	5	5	22	12	10	7	1	8	42	9
	Slight	1	1	0	0	1	1	0	6	2	0
	Serious	2	2	0	0	0	0	0	0	2	0
	Very serious	1	1	0	0	0	0	0	0	1	0
	Fatal	0	0	1	1	0	0	0	0	1	0
	Don't know	1	1	0	0	0	0	0	0	1	0
	No response/not applicable	88	88	164	88	138	93	12	92	398	90
Injury to other person (3)	None	1	1	3	2	1	1	1	8	13	2
	Slight	1	1	5	3	0	0	0	0	1	0
	Serious	0	0	0	0	0	0	0	0	0	0
	Very serious	0	0	0	0	0	0	0	0	0	0
	Fatal	0	0	0	0	0	0	0	0	0	0
	Don't know	1	1	0	0	0	0	0	0	0	0
	No response/not applicable	95	95	179	96	148	99	12	92	432	98

		Pre-driver		Control		Full		Simulator		Total	
Who reported accident to Police	Not reported	60	61	117	63	100	67	8	62	285	64
	You	12	12	30	16	27	18	0	0	69	15
	Third party	4	4	10	5	7	5	1	8	22	5
	Witness	5	5	11	6	2	1	2	15	20	4
	Not known	7	7	7	4	5	3	2	15	21	5
	Other	9	9	8	4	7	5	0	0	24	5
	No response	1	1	0	2	1	1	0	0	6	1
Details to insurance company	Yes	60	61	85	45	64	43	6	46	215	48
	No	37	38	99	53	84	56	7	54	227	51
	No response	1	1	3	1	1	1	0	0	4	1
Traffic Offence	Yes	5	5	16	9	6	4	1	8	28	6
	No	93	95	169	90	142	95	11	85	415	93
	Don't know	0	0	2	1	1	1	1	8	1	1
Other driver charged with traffic offence	Yes	5	5	9	5	6	4	0	0	20	4
	No	64	65	128	68	89	60	9	69	290	65
	Don't know	6	6	11	6	11	7	2	15	30	7
	Not applicable	22	22	38	20	41	28	2	15	103	23
Assessment of own responsibility for accident	0%	34	35	70	37	49	35	5	38	158	35
	10%	11	11	9	5	7	5	1	8	28	6
	20%	7	7	8	4	10	7	1	8	26	6
	30%	3	3	5	3	5	3	0	0	13	3
	40%	4	4	6	3	3	2	1	8	14	3
	50%	8	8	19	10	9	6	3	23	39	9
	60%	2	2	5	3	3	2	0	0	10	2
	70%	2	2	12	6	5	3	0	0	19	4
	80%	2	2	4	2	7	5	0	0	13	3
	90%	2	2	7	4	4	3	0	0	13	3
	100%	21	21	38	20	44	30	2	15	105	23

		Pre-driver		Control		Full		Simulator		Total	
Assigned assesment of responsibility for accident	0%	32	33	58	31	43	29	5	38	138	31
	10%	5	5	4	2	4	3	0	0	13	3
	20%	2	2	0	0	2	1	0	0	4	1
	30%	0	0	2	1	0	0	0	0	2	0
	40%	0	0	4	2	1	1	0	0	5	1
	50%	3	3	5	3	10	7	1	8	19	4
	60%	0	0	2	1	1	1	1	8	4	1
	70%	1	1	1	1	0	0	0	0	2	0
	80%	2	2	1	1	2	1	0	0	5	1
	90%	2	2	2	1	0	0	1	8	5	1
	100%	51	52	108	58	85	57	5	38	249	56
Did you know the road	Very well	19	19	51	27	52	35	8	62	130	29
	Quite well	11	11	32	17	19	13	1	8	63	14
	Not at all	15	15	14	7	22	15	1	8	52	12
	No response	53	54	90	48	56	38	3	23	202	45
Contributing factors	Parked vehicles	22	22	43	23	34	23	3	23	102	23
	Level Crossing	0	0	1	1	1	1	0	0	2	0
	Lamp post, road furniture etc.	6	6	17	9	10	7	2	15	35	8
	Dog on road	1	1	3	2	0	0	0	0	4	1
	Object on road	1	1	1	1	3	2	0	0	5	1
	None	54	55	96	51	84	56	2	15	236	53
	Road design	8	8	19	10	12	8	5	38	44	10
	Road user	6	6	6	3	5	3	1	8	18	4
Lapse of attention	Yes	13	13	30	16	34	23	2	15	79	18
	No	31	32	65	35	59	40	8	62	163	36
	No response	54	55	92	50	56	38	3	23	204	45

		Pre-driver		Control		Full		Simulator		Total	
00) Own Parked	Parked	5	5	9	5	2	1	0	0	16	4%
01)	Contributed-opened door	0	0	1	1	0	0	0	0	1	1%
02)	Failed to apply handbrake	0	0	0	0	2	1	0	0	2	1%
10 Single vehicle	Own Stationary/Stopping	14	14	25	13	13	9	1	8	53	12%
20) Single vehicle	Reversing	4	4	11	6	12	8	1	8	28	6%
21) Off the road	Forward	1	1	8	4	10	7	0	0	19	4%
30) Single	Turning right	3	3	4	2	7	5	0	0	14	3%
31) Vehicle	Turning left	6	6	5	3	4	3	1	8	16	4%
32) On The	Going straight on	4	4	4	2	5	3	0	0	13	3%
33) Road	Reversing	5	5	10	5	6	4	0	0	21	5%
34)	Overtaking parked car	1	1	1	1	1	1	0	0	3	1%
40) 2 Cars	Own in rear	13	13	26	14	19	13	3	23	61	14%
41) Other stationary	Different directions	0	0	1	1	0	0	0	0	1	1%
50) Overtaking	Being overtaken	4	4	2	1	2	1	0	0	8	2%
51)	Overtaking	3	3	9	5	7	5	0	0	19	4%
60)	Own Turning	6	6	17	9	10	7	1	8	34	8%
61) Turning	Other turning	11	11	14	7	21	14	2	15	48	11%
62)	Both turning	1	1	4	2	4	3	0	0	9	2%
70) 2 Vehicles	Head on	6	6	4	2	8	5	1	8	18	4%
71) Different	Head on - diverted	2	2	7	4	4	1	1	8	11	2%
72) Directions	Different directions junctions	1	1	8	4	4	3	0	0	14	3%
73)	Rolled back	0	0	0	0	1	1	0	0	1	1%
80) Same direction	Own in rear	1	1	5	3	3	2	0	0	9	2%
81) Not overtaking	Own in front	1	1	1	1	1	1	0	0	3	1%
82)	Side by side	2	2	4	2	0	0	0	0	6	1%
90 Pedestrian accidents		2	2	6	3	3	2	1	8	12	3%
99 Other		2	2	1	1	1	1	1	8	5	1%

Table 5.1.2 GIRLS Accident Description Form (% Accidents)

Number of accidents		Pre-driver		Control		Full		Simulator		Total	
		9	%	80	%	45	%	6	%	140	%
Occupation (from driving history questionnaire)	Student	4	44	44	55	30	67	4	67	43	59
	Earning	5	55	35	45	15	33	2	33	57	41
Additional part time or temporary job	Yes	6	66	42	53	25	56	4	67	77	55
	No	2	22	32	40	20	44	2	33	56	40
	No response	1	11	6	8	0	0	0	0	7	5
Vehicle usually drive	Yes	8	88	76	95	42	93	5	83	131	94
	No	1	11	4	5	3	7	1	17	9	6
Type of vehicle	Small car	2	22	34	43	17	38	1	17	54	39
	Medium saloon car	5	55	27	34	21	47	4	67	57	49
	Large saloon car	2	22	16	20	7	16	1	17	26	19
	Van	0	0	0	0	0	0	0	0	0	0
	Sports car	0	0	3	4	0	0	0	0	3	2
	No response	0	0	0	0	0	0	0	0	0	0
Engine size	0 - 1000 cc	1	11	32	40	13	29	0	0	46	33
	1001 - 1500 cc	6	66	32	40	26	58	6	100	70	50
	1501 - 2000 cc	2	22	16	20	5	11	0	0	23	16
	2000 cc and over	0	0	0	0	1	42	0	0	1	1
	No respones	0	0	0	0	0	0	0	0	0	0

		Pre-driver		Control		Full		Simulator		Total	
Age of car	Under 1 year	2	22	5	8	1	2	0	0	9	6
	Between 1 yr & under 2 yrs.	2	22	12	15	5	11	1	17	20	14
	" 2 " " 3 "	1	11	8	10	9	20	3	50	21	15
	" 3 " " 4 "	2	22	11	14	6	13	0	0	19	14
	" 4 " " 5 "	0	0	4	5	3	7	0	0	7	5
	" 5 " " 6 "	1	11	8	10	5	11	0	0	14	10
	" 6 " " 7 "	0	0	9	11	4	9	0	0	13	9
	" 7 " " 8 "	0	0	9	11	2	4	1	17	12	9
	" 8 " " 9 "	1	11	6	8	1	2	0	0	8	6
	" 9 " " 10 "	0	0	1	1	3	7	1	17	5	4
	" 10 " " 11 "	0	0	2	3	2	4	0	0	4	3
	11 years and over	0	0	3	4	1	2	0	0	4	3
	No response	0	0	1	1	3	7	0	0	4	3
Purpose of Journey	Social	6	66	51	64	32	71	3	50	92	66
	Work	0	0	4	5	1	2	0	0	5	4
	To or from Work/study	1	11	20	25	6	13	1	17	28	20
	Driving instruction	2	22	5	6	6	13	2	33	15	11
	Other	0	0	0	0	0	0	0	0	0	0
Total number of vehicles involved in accident	One	2	22	19	24	17	38	3	50	41	29
	Two	6	66	57	71	23	51	3	50	89	64
	Three	1	11	40	5	3	7	0	0	8	6
	Four	0	0	0	0	2	4	0	0	2	1
Type of other vehicle involved	Car	6	66	37	46	16	36	0	0	59	42
	Van	1	11	11	14	4	9	0	0	16	11
	Motor Cycle	0	0	3	4	1	2	1	17	5	4
	Lorry	0	0	7	8	6	13	1	17	13	9
	Bus	0	0	1	1	1	2	1	17	6	4
	No response	0	0	2	4	0	0	0	0	0	0
	Not applicable	2	22	19	24	17	38	3	50	41	29
Within 15 miles home.	YES	9	99	54	80	41	91	6	100	120	86
	NO	0	0	16	20	4	9	0	0	20	14

		Pre-driver		Control		Full		Simulator		Total	
Did you know the road:	very well	3	33	29	36	12	27	2	33	46	33
	quite well	1	11	15	19	6	13	1	17	23	16
	not at all	1	11	10	13	3	7	0	0	14	10
	no response	4	44	26	33	24	53	3	50	57	41
Contributing factors:	parked vehicle	2	22	13	16	4	9	1	17	20	14
	level crossing	0	0	0	0	0	0	0	0	0	0
	lamp post, road junction, etc.,	0	0	9	11	11	24	0	0	20	14
	dog on road	0	0	0	0	0	0	0	0	0	0
	object on road	0	0	5	6	1	2	0	0	6	4
	none	5	55	40	50	20	44	5	83	70	50
	road design	1	11	8	10	6	13	0	0	15	11
	road user	0	0	4	5	3	7	0	0	7	5
lapse of attention	yes	1	11	17	21	9	20	1	17	28	20
	no	3	33	37	46	13	29	1	17	54	39
	no response	5	55	26	33	23	51	4	67	58	41

		Pre-driver		Control		Full		Simulator		Total	
Kind of road	Motorway	0	0	0	0	0	0	0	0	0	0
	Clearway	0	0	0	0	0	0	0	0	0	0
	Dual carriageway	0	0	1	1	2	4	1	17	4	3
	Four lane road	2	22	9	11	5	11	0	0	16	11
	Three lane road	2	22	4	5	2	4	0	0	8	6
	Two lane road	4	44	35	44	17	38	3	50	59	42
	One way street	0	0	6	8	4	9	1	17	11	8
	No lane marking	0	0	15	19	3	7	1	17	19	14
	Don't know	0	0	1	1	1	2	0	0	2	1
	Other	1	22	9	11	11	24	0	0	21	15
Speed limit	30 mph	8	88	60	75	25	56	3	50	96	69
	40 mph	0	0	1	1	2	4	0	0	3	2
	50 mph	0	0	1	1	0	0	0	0	1	1
	60 mph	0	0	0	0	0	0	0	0	0	0
	70 mph	0	0	4	5	3	7	2	33	9	6
	Don't know	0	0	3	4	2	4	0	0	5	4
	Other	1	11	11	14	13	29	1	17	26	19
Light conditions	Dawn	0	0	1	1	0	0	0	0	1	1
	Daylight	5	55	40	50	25	56	6	100	76	54
	Dusk	3	33	10	13	3	7	0	0	16	11
	Dark (unlit)	0	0	8	10	5	11	0	0	13	9
	Dark (lit)	1	11	21	26	12	27	0	0	34	24
Weather conditions	Clear	7	77	56	70	33	73	6	100	102	73
	Rain	2	22	22	27	10	22	0	0	34	24
	Snow	0	0	1	1	1	2	0	0	2	1
	Fog	0	0	1	1	1	2	0	0	2	1
	Severe Winds	0	0	0	0	0	0	0	0	0	0
Road conditions	Dry	7	77	52	65	30	67	5	83	94	67
	Greasy	0	0	4	5	0	0	0	0	4	3
	Wet	2	22	22	27	12	27	0	0	36	26
	Muddy	0	0	0	0	2	4	0	0	2	1
	Icy	0	0	2	3	1	2	1	17	4	3

		Pre-driver		Control		Full		Simulator		Total	
Road Surface	Smooth	8	88	61	76	36	80	4	67	109	78
	Pot-holed	0	0	7	9	1	2	1	17	5	6
	Loose chippings	0	0	4	5	6	13	1	17	11	8
	Cobbled	1	11	1	1	2	4	0	0	4	3
	No response	0	0	0	0	0	0	0	0	7	5
At or near	Roundabout	0	0	6	8	2	4	1	17	9	6
	'Y' junction	0	0	5	6	1	2	0	0	6	4
	Junction (more than 4 roads)	0	0	1	1	1	2	0	0	2	1
	Private drive/entrance/car park	1	11	7	9	12	25	1	17	21	15
	Staggered junction	0	0	2	3	0	0	0	0	2	1
	'T' junction	4	44	10	13	8	16	2	33	24	17
	Crossroads	2	22	7	9	9	18	0	0	18	13
	Another type of junction	0	0	1	1	0	0	0	0	1	1
	Pedestrian crossing	1	11	8	10	8	16	0	0	17	12
	Not at a junction	1	11	32	40	5	10	2	33	40	29
Manoeuvre of own vehicle.	Making normal progress	1	11	14	18	10	22	1	17	26	19
	Waiting to go ahead, but held up	1	11	2	3	1	2	0	0	4	3
	Overtaking or moving a held up vehicle	1	11	6	8	2	4	0	0	9	6
	Turning or waiting to turn right or left.	2	22	25	31	13	29	3	50	43	31
	Slowing down or stopping e.g., at lights	1	11	9	11	3	7	1	17	14	10
	Moving off	0	0	7	9	1	2	0	0	8	6
	Parked	0	0	3	4	0	0	0	0	3	2
	Parking/Reversing/Trn rnd.	3	33	14	18	14	31	1	17	32	23
	No response	0	0	0	0	0	0	0	0	0	0
Manoeuvre of other vehicle (no 1)	Making normal progress	1	11	12	15	7	16	1	17	21	15
	Waiting to go ahead but held up.	1	11	0	0	1	2	0	0	2	1
	Overtaking a moving or held up vehicle.	0	0	9	11	3	7	1	17	13	9

		Pre-driver		Control		Full		Simulator		Total	
Manoeuvre of other vehicle (no 1) Continued.	Turning or waiting to turn rt/lft.	2	22	13	16	4	9	1	17	20	14
	Slowing down or stopping e.g. at lights	4	44	9	11	3	7	0	0	16	11
	Moving off	0	0	5	6	3	7	0	0	8	6
	Parked	0	0	7	9	5	1	0	0	12	9
	Parking, reversing & turning round.	0	0	5	6	2	4	0	0	7	5
	Not applicable	1	11	20	25	17	38	3	50	41	29
Manoeuvre of other vehicle (2)	Making normal progress	0	0	2	3	1	2	0	0	3	2
	Waiting to go ahead, but held up	0	0	0	0	0	0	0	0	0	0
	Overtaking a moving or held up vehicle.	0	0	0	0	1	2	0	0	1	1
	Turning or waiting to turn	0	0	0	0	1	2	0	0	1	1
	Slowing down or stopping e.g. at lights.	1	11	1	1	1	2	0	0	3	2
	Moving off	0	0	0	0	0	0	0	0	0	0
	Parked	0	0	1	1	1	2	2	0	2	1
	Parking, reversing or turning round.	0	0	0	0	0	0	0	0	0	0
	Not applicable	8	89	76	95	39	87	0	100	123	88
Manoeuvre of other vehicle (3)	Making normal progress	0	0	0	0	1	2	0	0	1	1
	Waiting to go ahead, but held up	0	0	0	0	0	0	0	0	0	0
	Overtaking a moving or held up vehicle	0	0	0	0	0	0	0	0	0	0
	Turning or waiting to turn rt or lft.	0	0	0	0	1	2	0	0	1	1
	Slowing down or stopping e.g. at lights.	0	0	0	0	0	0	0	0	0	0
	Moving off	0	0	0	0	0	0	0	0	0	0

		Pre-driver		Control		Full		Simulator		Total	
Manoeuvre of other vehicle (no 3)	Parked	0	0	0	0	0	0	0	0	0	0
	Parking, reversing turning round.	0	0	0	0	0	0	0	0	0	0
	Not applicable	9	100	80	100	42	93	6	100	137	98
Pedestrian	None	9	99	76	95	43	96	6	100	134	94
	Crossing at Ped x.	0	0	1	1	1	2	0	0	2	1
	Crossing the road within 20 yds Ped x.	0	0	0	0	0	0	0	0	0	0
	Crossing elsewhere	0	0	2	3	0	0	0	0	2	1
	On the pavement	0	0	0	0	0	0	0	0	0	0
	On central strip	0	0	1	1	0	0	0	0	1	1
	Boarding or alighting a bus	0	0	0	0	0	0	0	0	0	0
	On road not crossing	0	0	0	0	1	2	0	0	1	1
Seat belt worn by driver	Yes	0	0	22	27	14	31	4	67	40	29
	No	8	88	56	65	28	62	2	33	90	64
	Not fitted	0	0	6	8	2	4	0	0	8	6
Seat belt worn by passenger	Yes	0	0	8	10	5	11	1	17	14	10
	No	8	8	33	41	19	42	1	17	61	44
	Not fitted	0	0	3	4	2	4	0	0	5	4
	No passenger	0	0	34	43	18	40	4	67	56	40
Drink	No-one	7	77	74	93	39	87	6	100	126	90
	Driver	1	11	1	1	3	7	0	0	5	4
	Other driver(1)	0	0	3	4	0	0	0	0	3	2
	Other driver(2)	0	0	0	0	0	0	0	0	0	0
	Pedestrian	0	0	1	1	1	2	0	0	2	1
	Passengers	0	0	0	0	1	2	0	0	1	1

		Pre-driver		Control		Full		Simulator		Total	
Parts of own vehicle hit	Front	3	33	28	35	13	29	1	17	45	32
	Back	3	33	18	23	11	24	1	17	33	24
	Nearside	1	11	22	27	15	33	2	33	40	29
	Offside	2	22	12	15	6	13	2	30	22	16
	Not applicable	0	0	0	0	0	0	0	0	0	0
Parts of other vehicle hit (1)	Front	3	33	22	27	11	24	1	17	37	26
	Back	1	11	17	21	6	13	1	17	25	18
	Nearside	1	11	13	16	3	7	1	17	18	13
	Offside	2	22	8	10	8	18	0	0	18	13
	Not applicable	2	22	20	25	0	0	3	50	42	30
Parts of other vehicle hit (2)	Front	0	0	1	1	2	4	0	0	4	3
	Back	0	0	1	1	3	7	0	0	1	1
	Nearside	0	0	0	0	0	0	0	0	0	0
	Offside	1	11	1	1	0	0	0	0	2	1
	Not applicable	8	88	77	95	40	89	6	100	133	95
Cost of repairing own vehicle	£0	1	11	14	18	9	20	3	50	27	19
	£1 - £25	4	44	38	48	21	47	3	50	66	47
	£26 - £50	0	0	12	15	5	11	0	0	17	12
	£50 + vehicle driven away	2	22	7	9	3	7	0	0	12	9
	£50 + vehicle not drivable	1	11	7	9	3	7	0	0	11	8
	Write off	0	0	0	0	4	9	0	0	4	3
	Don't know	0	0	2	3	0	0	0	0	2	1
	No response	1	11	0	0	0	0	0	0	1	1
Cost of repairing other vehicle (1)	£0	0	0	13	16	3	7	0	0	16	11
	£1 - £25	2	22	10	13	7	16	1	17	20	14
	£26 - £50	0	0	9	11	1	2	0	0	10	7
	£50 + vehicle driven away	0	0	2	3	1	2	0	0	3	2
	£50 + " not driven away	0	0	2	3	0	0	0	0	2	1
	Write off	1	11	1	1	1	2	0	0	3	2
	Don't know	3	33	24	30	13	29	2	33	42	30
	No response	0	0	0	0	0	0	0	0	0	0
	Not applicable	3	33	19	24	19	42	3	50	44	31

		Pre-driver		Control		Full		Simulator		Total	
Cost of repairing other vehicle (2)	£0	0	0	1	1	2	4	0	0	3	2
	£1 - £25	1	11	1	1	0	0	0	0	2	1
	£26 - £50	0	0	1	1	0	0	0	0	1	1
	£50 + vehicle drivable	0	0	0	0	0	0	0	0	0	0
	£50 + " not "	0	0	0	0	0	0	0	0	0	0
	Write off	0	0	0	0	1	2	0	0	1	1
	Don't know	0	0	1	1	2	4	0	0	3	2
	Not applicable	8	88	76	95	40	89	6	100	130	93
Who paid for own vehicle	Not repaired	3	33	19	24	14	31	3	50	39	28
	You	4	44	35	44	18	40	3	50	60	43
	Your insurance Co.,	0	0	4	5	2	4	0	0	6	4
	The other person	0	0	8	10	1	2	0	0	9	6
	His insurance Co.	0	0	10	13	6	13	0	0	16	11
	Don't know	1	11	2	3	4	9	0	0	7	5
	Cost divided	0	0	0	0	0	0	0	0	0	0
	No response	1	11	2	3	0	0	0	0	0	0
Who paid for repairing other Vehicle (1)	Not repaired	0	0	12	15	5	11	0	0	17	12
	You	3	33	8	10	2	4	1	17	14	10
	Your insurance Co.,	0	0	3	4	1	2	0	0	4	3
	The other person	0	0	6	8	0	0	0	0	6	4
	His insurance Co.	0	0	8	10	4	9	0	0	12	9
	Don't know	3	33	21	26	13	29	2	33	39	28
	Cost divided	0	0	0	0	1	2	0	0	1	1
	Not applicable	3	33	22	27	19	42	3	50	47	34
Who paid for repairing other vehicle (2)	Not repaired	0	0	1	1	2	4	0	0	3	2
	You	1	11	0	0	0	0	0	0	1	1
	Your insurance company	0	0	0	0	0	0	0	0	0	0
	The other person	0	0	0	0	0	0	0	0	0	0
	His insurance Co.	0	0	0	0	0	0	0	0	0	0
	Don't know	0	0	3	4	3	7	0	0	6	4
	Cost divided	0	0	0	0	0	0	0	0	0	0
	Not applicable	8	88	76	95	40	89	6	100	130	93

		Pre-driver		Control		Full		Simulator		Total	
Injury to self	None	9	99	77	96	43	96	6	100	135	96
	Slight	0	0	3	4	1	2	0	0	4	3
	Serious	0	0	0	0	1	2	0	0	1	1
	Very serious	0	0	0	0	0	0	0	0	0	0
Injury to other (1)	None	7	77	58	73	24	53	4	67	93	66
	Slight	0	0	3	4	4	9	0	0	7	5
	Serious	0	0	1	1	0	0	0	0	1	1
	Very serious	0	0	0	0	1	2	0	0	1	1
	Fatal	0	0	0	0	0	0	0	0	0	0
	Don't know	0	0	0	0	0	0	0	0	0	0
	No response	2	22	18	23	16	36	2	33	38	27
Injury to other (2)	None	1	11	6	8	7	16	0	0	14	10
	Slight	0	0	0	0	0	0	0	0	0	0
	Serious	0	0	0	0	0	0	0	0	0	0
	Very serious	0	0	0	0	1	2	0	0	1	1
	Fatal	0	0	0	0	0	0	0	0	0	0
	Don't know	0	0	0	0	0	0	0	0	0	0
	No response	8	88	74	93	37	82	6	100	125	89
Injury to other (3)	None	0	0	0	0	1	2	0	0	1	1
	Slight	0	0	0	0	0	0	0	0	0	0
	Serious	0	0	0	0	0	0	0	0	0	0
	Very serious	0	0	0	0	1	2	0	0	1	1
	Fatal	0	0	0	0	0	0	0	0	0	0
	Don't know	0	0	0	0	0	0	0	0	0	0
	No response	9	99	80	100	43	96	6	100	138	99
Who reported accident to police	Not reported	6	66	54	68	32	71	5	83	97	69
	You	2	22	15	19	4	9	1	17	22	16
	Third party	0	0	2	3	2	4	0	0	4	3
	Witness	0	0	2	3	2	4	0	0	4	3
	Not known	0	0	1	1	1	2	0	0	2	1
	Other	1	11	5	6	4	9	0	0	10	7
	No response	0	0	1	1	0	0	0	0	1	1

		Pre-driver		Control		Full		Simulator		Total	
Details to insurance company	Yes	3	33	28	35	14	31	1	17	46	33
	No	6	66	51	64	31	69	5	83	93	66
	No response	0	0	1	1	0	0	0	0	1	1
Whether charged with traffic offence	Yes	1	11	2	3	4	9	0	0	7	5
	No	8	88	77	96	41	91	3	50	132	94
	Don't Know	0	0	1	1	0	0	3	50	4	1
Other driver charged with traffic offence	Yes	0	0	4	5	1	2	0	0	5	4
	No	5	55	53	66	22	49	3	50	83	59
	Don't know	2	22	4	5	5	11	0	0	11	8
	Not applicable	2	22	19	24	17	38	3	50	41	29
Assessment of own responsibility for accident	0%	4	44	33	41	15	33	2	33	54	39
	10%	0	0	4	5	0	0	0	0	4	3
	20%	0	0	1	1	0	0	0	0	1	1
	30%	0	0	2	3	2	4	0	0	3	2
	40%	1	11	7	9	0	0	0	0	2	1
	50%	0	0	1	1	3	7	1	17	12	9
	60%	0	0	4	5	0	0	0	0	1	1
	70%	0	0	0	0	1	2	0	0	5	4
	80%	0	0	0	0	0	0	0	0	0	0
	90%	0	0	2	3	5	11	0	0	7	5
	100%	3	33	23	27	16	36	3	50	44	31
Assigned assessment for responsibility for accident	0%	3	33	31	39	9	20	1	17	44	31
	10%	0	0	1	1	1	2	0	0	2	1
	20%	0	0	2	3	0	0	0	0	2	1
	30%	0	0	0	0	0	0	0	0	0	0
	40%	0	0	1	1	0	0	0	0	1	1
	50%	0	0	2	3	3	7	1	17	6	4
	60%	0	0	0	0	0	0	0	0	0	0
	70%	0	0	1	1	0	0	0	0	1	1
	80%	0	0	0	0	0	0	0	0	0	0
	90%	0	0	0	0	1	2	0	0	1	1
	100%	6	66	42	53	31	69	4	67	83	59

Accident Type		Pre-driver		Control		Full		Simulator		Total	
00)	(Own parked										
01) PARKED -----	(Parked-contd- opened door	0	0	2	3	1	2	0	0	3	2
02)	(Parked- failed to apply	0	0	0	0	0	0	0	0	0	0
	(hand brake	0	0	0	0	0	0	0	0	0	0
10	(Stationary/stopping	1	11	12	15	5	11	0	0	18	13
20) Off the ------	(Reversing off the road	2	22	5	6	5	11	0	0	12	9
21) Road	(forward off the road	0	0	6	8	7	16	0	0	13	9
30) Single	(Turning right (bend)	0	0	2	3	4	9	1	17	7	5
31) Vehicle	(Turning left (bend)	0	0	4	5	0	0	1	17	5	4
32) on -----	(going straight on	0	0	0	0	0	0	0	0	0	0
33) the	(reversing	1	11	6	8	6	13	1	17	14	10
34) road	(overtaking parked car	0	0	1	1	0	0	0	0	1	1
40) two vehicles	(own in rear	1	11	8	10	1	2	0	0	10	7
41) on the road -----	(Own from different direction	0	0	0	0	0	0	0	0	0	0
42)	(reversing	0	0	1	1	1	2	0	0	2	1
50) -- overtaking ----	(being overtaken	0	0	2	3	0	0	0	0	2	1
51)	(overtaking	0	0	1	1	1	2	0	0	2	1
60)	(own turning	2	22	10	13	6	13	2	33	20	14
61) --Turning ----	(other turning	2	22	8	10	4	9	0	0	14	10
62)	(both turning	0	0	3	4	0	0	1	17	4	3
70) two vehicles	(head on (opposite)	0	0	2	3	0	0	0	0	2	1
71) different ----	(head on diverted (opposite)	0	0	1	1	0	0	0	0	1	1
72) directions	(different directions (junctions)	0	0	2	3	1	2	0	0	3	2
73)	Rolled back	0	0	0	0	0	0	0	0	0	0
80) two vehicles	(own in rear	0	0	1	1	0	0	0	0	1	1
81) same ----	(own in front	0	0	1	1	0	0	0	0	1	1
82) direction	(side by side	0	0	0	0	2	2	0	0	2	1
90 All pedestrian accidents		0	0	1	1	1	1	0	0	2	1
99 Other		0	0	1	1	0	0	0	0	1	1

CAR ACCIDENTS AND TIME OF DAY

	Pre B	Con B	Full B	Sim B	Pre G	Con G	Full G	Sim G	Total B	Total G
00	0 0	1 1	1 1	0 0	0 0	0 0	0 0	0 0	2 0	0 0
01	1 1	2 1	3 2	0 0	0 0	2 3	2 4	0 0	6 1	4 3
02	2 2	2 1	1 1	0 0	1 11	0 0	0 0	0 0	5 1	1 1
03	0 0	1 1	0 0	0 0	0 0	0 0	0 0	0 0	1 0	0 0
04	1 1	1 1	0 0	0 0	0 0	0 0	0 0	0 0	2 0	0 0
05	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
06	0 0	0 0	1 1	0 0	0 0	0 0	0 0	0 0	1 0	0 0
07	0 0	1 1	1 1	0 0	0 0	1 1	0 0	0 0	2 0	1 1
08	3 3	7 4	5 3	1 8	0 0	6 8	0 0	0 0	16 4	6 4
09	7 7	7 4	6 4	1 8	1 11	3 4	0 0	1 17	21 5	5 4
10	0 0	9 5	3 2	0 0	0 0	0 0	2 4	0 0	12 3	2 1
11	5 5	5 3	9 6	0 0	0 0	4 5	3 7	1 17	19 4	8 6
12	6 6	8 4	2 1	1 8	0 0	2 3	4 9	0 0	17 4	6 4
13	5 5	8 4	6 4	0 0	1 11	3 4	0 0	1 17	19 4	5 4
14	6 6	12 6	9 6	0 0	1 11	10 13	2 4	1 17	27 6	13 9
15	10 10	21 11	5 3	0 0	0 0	2 3	4 9	0 0	36 8	7 5
16	7 7	19 10	8 5	3 23	0 0	1 1	1 2	0 0	37 8	3 2
17	5 5	15 8	16 11	2 15	2 22	7 9	7 16	1 17	38 9	16 11
18	6 6	7 4	8 5	2 15	1 11	5 6	3 7	0 0	23 5	9 6
19	4 4	10 5	16 11	1 8	0 0	6 8	6 13	0 0	31 7	13 9
20	4 4	5 3	7 5	0 0	0 0	9 11	2 4	0 0	16 4	11 8
21	3 3	15 8	14 9	0 0	0 0	6 8	3 7	0 0	32 7	9 6
22	7 7	11 6	10 7	0 0	1 11	6 8	2 4	0 0	28 6	9 6
23	6 6	12 6	14 9	1 8	0 0	5 6	0 0	0 0	33 7	5 4
24	7 7	7 4	4 3	1 8	0 0	2 3	3 7	0 0	19 4	5 4

Table 5.1.3 : Classification of Accident situations

Type	Accident situation - own car	Code No.
1.	Own parked : hit by another vehicle	00
	: contributed, e.g. opened door	01
	: failed to apply handbrake	01
2.	Own stationary/stopping/moving off, i.e. 0-5 mph and other moving e.g. hit in back, at side, moving off at junction, reversed into.	10
3.	Single vehicle accident - or where a parked car involved manoeuvring off the road.	
	: reversing	20
	: forward	21
4.	Single moving vehicle or where parked car involved, on the road.	
	: turning right or right hand bend	30
	: " left " left " "	31
	: going straight on	32
	: reversing	33
	: overtaking parked car	34
5.	Own moving, other stationary or stopping.	
	: approaching from rear	40
	: approaching from different directions	41
	: reversing (own)	42
6.	Two or more cars involved - both moving overtaking	
	: being overtaken	50
	: overtaking	51
7.	Two or more cars involved - both moving turning	
	: own turning	60
	: other turning	61
	: both turning	62
8.	Two or more cars - both moving opposite/different directions	
	: head on (opposite)	70
	: head on diverted e.g. hit wall, vehicle on left	71
	: different directions e.g. at junctions	72
	: different directions, rolling back	73
9.	Two or more vehicles - both moving same direction, not overtaking i.e. different speeds.	
	: Own in rear	80
	: own in front	81
	: side by side	82
10.	All pedestrian accidents	90
11.	Other accidents - hit by falling beer barrels - object in road - vehicle on tow	99

TABLE 5.1.4 BOYS' ACCIDENTS ACCORDING TO ACCIDENT SITUATION

	Pre	Control	Full	Sim	Total
own parked	5 (7)	10 (8)	4 (8)	0	19 (8)
own stationary/stopping	14 (3)	25 (3)	13 (6)	1	53 (4)
single vehicle off the road	5 (7)	19 (5)	22 (3)	1	47 (5)
single vehicle on the road	19 (1)	24 (4)	23 (2)	1	67 (2)
2-cars - other stationary	13 (4)	27 (2)	19 (4)	3	62 (3)
overtaking accidents	7 (6)	11 (7)	9 (7)	0	27 (7)
2 vehicles - different directions	9 (5)	19 (5)	14 (5)	2	44 (6)
2 vehicles - same direction	4 (9)	10 (8)	4 (8)	0	18 (9)
turning	18 (2)	35 (1)	35 (1)	3	91 (1)
pedestrian	2 (10)	6 (10)	3 (10)	1	12 (10)
other	2 (10)	1 (11)	1 (11)	1	5 (11)
Total	98	187	149	13	447

Figures in brackets denote rank order.

TABLE 5.1.5 GIRLS' ACCIDENTS CLASSIFIED ACCORDING TO ACCIDENT SITUATION

	Pre	Control	Full	Sim	Total
own parked	0	2 (8)	1 (6)	0	3 (8)
own stationary/stopping	1 (3)	12 (3)	5 (3)	0	18 (4)
single vehicle off the road	2 (2)	11 (4)	12 (1)	0	25 (3)
single vehicle on the road	1 (3)	13 (2)	10 (2)	3(1)	27 (2)
2 cars - other stationary	1 (3)	9 (5)	2 (4)	0	12 (5)
2 cars - overtaking	0	3 (7)	1 (6)	0	2 (9)
2 vehicles - different directions	0	5 (6)	1 (6)	0	6 (6)
2 vehicles - same direction	0	2 (8)	2 (4)	0	4 (7)
2 vehicles - turning	4 (1)	23 (1)	10 (2)	3(1)	38 (1)
pedestrian	0	1 (10)	1 (6)	0	2 (9)
other	0	1 (10)	0	0	1 (11)
Total	9	80	45	6	140

Figures in brackets denote rank order.

wherever people need to cross the road other than at intersections, e.g. outside major buildings etc. There are fewer decisions to alter speed and direction due to different classes of road users with different objectives and therefore different driving characteristics. For example, there is off-street access to shops, factories, goods depots etc., and therefore few vehicles loading and unloading on the street. Because of the regional economies, as opposed to a national economy as in this country, there are few cities that have only one major industry and hence there are fewer heavy goods vehicles travelling long distances.

Despite the obvious implications of the road structure for driver behaviour and consequently accidents, the driver behaviour research literature is not characterised by an explicit recognition of the importance of the road design in affecting the drivers' decisions to alter speed and direction. Most driver behaviour research tends to concentrate on the relationship between the way a particular manoeuvre is carried out, i.e. the procedure, and safety, e.g. overtaking (I.D.B.R.A., 1973), rather than on the relationship between the drivers' actions and the road configuration. i.e. Driver behaviour tends to be seen as isolated from the road environment. It is the relationship between the procedure and the manoeuvre that is critical for safety. While this is a very promising area for accident research, it is difficult to draw any conclusions from our own data vis a vis the relative difficulty presented by different types of road design since we have no data regarding the frequency with which these situations were encountered. Thus this investigation can only serve as an exploratory study.

Data were collected from those involved in accidents about the kind of road they were driving on when the accident occurred. Table 5.1.1 shows the distribution of accidents on the different types of road for each group in the boys' sample. Nearly half of the accidents took place on two lane roads, i.e. where there was only room for two cars side by side. Roads with no lane markings and four lane roads were the other most frequent type of road along which accidents occurred, although they each accounted for only 11% of the accidents. Because of the few accidents occurring on motorways, clearways and dual-carriageways, and because in some respects these roads are not dissimilar being designed for fast moving traffic, with limited access and separation of traffic streams, these categories were combined when testing the differences between the frequency distributions of the boys' groups for statistical significance. The differences were found to be significant at the 5% level. Thus the three Salford groups of boys had a different distribution of accidents from each other. The fully trained boys had a greater proportion of their accidents on two lane roads and off the public roads (i.e. "other" category), and fewer on motorways/clearways/dual carriageways and four lane roads than the other groups. This would tend to indicate that the control boys had more difficulty with speed control and the fully trained boys with car control, particularly at low speeds. Although the proportion of driving on motorways was very similar for each of the groups since the trained boys drove fewer miles than the control boys, they drove fewer miles than the control boys on motorways.

Table 5.1.2 shows the same information for the girls' groups. Here also, accidents on two-lane roads were the most frequent type of accident, followed by roads with no lane marking, accidents off the public roads ("other" category) and on four-lane roads. There were no significant differences within the girls' sample. Thus the boys' and girls' accidents were broadly similar - the chief differences being that the girls had fewer accidents on motorways/clearways/dual carriageways and on two-lane roads, but more off the public roads. Thus, the chief distinction appears to be for the boys, the opportunity for higher speeds offered by the different types of road, and for the girls, the greater difficulty in controlling the car at low speeds.

The difference between the boys' and girls' involvement in motorway accidents could be expected in view of the fact that the girls reported that they drove very little on motorways. In addition, in proportion to the total mileage driven on motorways, accident involvement on motorways is very small. (25% of those who drove in the seven days prior to being questioned in 1974 said that they drove about half or more of their mileage on motorways). Again, this under-representation of motorway accidents could be expected on the basis of the fact that, in relation to mileage travelled, accidents occur on motorways at one tenth the frequency rate of those on other roads, for the UK as a whole. (D.O.E., 1973). Other than this, little can be said about the relative difficulty of the other types of road since nothing is known about the proportion of mileage driven on each type of road. It is not clear whether the majority of accidents took place on two lane roads because this is where most of their driving was done or because this type of road presents greater difficulty to young drivers than other types of road.

The speed limit on the road on which the accident occurred was also ascertained. Nearly three quarters of the boys' accidents took place on roads with a 30 mph speed limit. The other major category, "other" refers to those roads with no, or a very low, speed limit, i.e. private roads, car parks or driveways. When the accidents occurring on roads with higher speed limits were combined, the groups were found to differ significantly at the 5% level with respect to the distribution of accidents on roads with different speed limits. This seems to be accounted for by the trained boys having more accidents off the public roads where there are no, or very low, speed limits.

Table 5.1.2 shows similar information for the girls' groups. Once again the most frequent kind of road where the accidents took place was those with a 30 mph speed limit. About two-thirds of the accidents took place on such roads. The second major group of accidents took place on roads, driveways, car parks etc. where there was no speed limit. There was some variation between the girls' groups and the differences were found to be significant at the 5% level. The chief factor that accounted for this was the high proportion of accidents occurring off the public roads among the fully trained girls' group.

When the boys and girls are compared, it can be seen that the girls had more accidents on roads with low or no speed limit, and the boys had more accidents on 30 mph roads and on the high speed roads than did the girls. Again, this is consistent with the differences in mileage driven on motorways reported by the boys and girls. In addition, the lower weekly mileage reported by the trained groups within each sample, and by the girls implies that proportionately, manoeuvring off the public roads when moving off or parking, must involve a larger proportion of the time behind the wheel for the girls than the boys. Consequently one could expect more accidents on this type of roadway where there is no legal speed limit.

Data were also collected on the nature of the road surface at the site where the accident occurred. It can be seen that the majority (about 80%) of the boys' accidents took place on smooth road surfaces. Only 10% took place on potholed or cobbled roads or those with loose chippings, i.e. the types of road surface which are more difficult or more uncomfortable to drive on. There were no differences within the boys' sample. The majority of the girls' accidents also took place on smooth road surfaces. When the boys' and girls' accidents are compared, it can be seen that the girls had slightly more accidents on non-smooth road surfaces. This difference was not significant at the 5% level. It is consistent with the previous findings that they had more off-road accidents where lack of car control at low speed appeared to be the major problem. Other than this, it is difficult to draw any conclusions about the relative complexity of the driving task on different

types of road surface.

The sample were also to provide information about the configuration of the road at the place of the accident. The road configuration was assigned to one of the various categories shown in Table 5.1.1 according to the relevance of the particular road feature. For example, a driver might report that the accident took place near a zebra crossing (although no one was on or near it) and a side street, and neither of these two features was relevant to the accident which occurred when he went into the back of a bus which was pulling up at a bus stop. Thus, this accident would be assigned to the "not at a junction" group. Table 5.1.1 shows the distribution of accidents at each type of road configuration. It can be seen that the most frequent type which occurred in 33% of cases, did not take place at a junction. T junctions and crossroads were the next most hazardous - as reflected in accident frequency sites. The fourth important set of accidents took place off the public roads. Although there was some variation within the boys' sample, the differences were not significant. Table 5.1.2 shows that for the girls, most accidents did not take place at a junction or any other kind of hazardous road configuration. This kind of site accounted for slightly less than one third of the accidents. The other major types of road configuration were T junctions, off the public roads and crossroads. Again, although there was a considerable amount of variation within the girls' sample, these differences were not statistically significant. When, however, only the control and fully trained girls' groups are considered, and only the four major groups of accidents, which account in both cases for 70% of the accidents, the differences were found to be significant at the 5% level - with the fully trained girls having most of their accidents off the road and the control girls having most of their accidents on the public roads, but not at a junction. It can be seen that there is very little difference between the boys' and girls' accidents with respect to the road situation.

Thus it can be seen that apart from those accidents occurring off the public roads (usually trivial, parking accidents), the two most frequent types of junctions, namely T junctions and crossroads, combined, accounted for a similar proportion of accidents as those where intersections were not involved. Given that most of the time a driver spends controlling the car is not at junctions, it can be seen that junctions constitute the greatest source of hazard. Given also, the differences in skill as measured by driving experience, between the groups and between the boys' and girls' sample, it can be seen that the relative degree of hazard present in these two different types of road configuration appear to be remarkably constant. This would tend to imply that the ability to negotiate junctions, and to "make normal progress", improves at a constant rate, i.e. one skill is not learned faster than the other. When the accident rates per mile for these two types of manoeuvre are compared for the boys and girls, the boys' rates were slightly lower. Since the boys' experience was considerably greater than that of the girls, it must be assumed that these are fairly difficult tasks to learn.

Data collected about the drivers' manoeuvre immediately prior to the accident could provide some information about the way the road structures the kinds of manoeuvres a driver can perform and the relative difficulty in carrying out the tasks imposed by the different road structure. It can be seen from Table 5.1.1 that in the boys' sample, the most frequent activity on the part of the driver was "making normal progress". That is, not carrying out any particular manoeuvre. This is of course to be expected since the greater proportion of the road network is characterised by the absence of junctions, pedestrian crossings etc. The second most important category involved the driver turning or waiting to turn. The other important categories are those of overtaking either a moving or held up or parked vehicle and manoeuvring at slow speeds. Thus the major factor to emerge is the difficulty imposed by the

road in maintaining speed and forward direction and also in permitting the lateral relationship between two vehicles as in the overtaking manoeuvre, i.e. the view of the road as a channel permitting traffic to flow. The other major problem appears to be the difficulty presented by the road network in changing direction. In so far as the road user spends less time changing direction than progressing along the road, clearly the way the roads permit the driver to change direction presents even greater difficulty than that of maintaining speed and direction. There is some variation between the groups in the boys' sample but not sufficient to attain statistical significance.

Table 5.1.2 shows the frequency of the girls' manoeuvres immediately before the accident. The most frequent manoeuvre was that of turning, followed by the slow speed manoeuvres and "making normal progress". Thus, the design of intersections presents greater problems for the girls than the boys. The differences between the girls' and boys' accidents suggest some interaction between the road configuration and human factors. In so far as there is variation between drivers in this respect, it would suggest that this is an area of driver behaviour which is modifiable directly by means of the driver per se.

The analysis in the previous section relating to the most frequent type of accident situation showed that the boys most frequent types of accident involved at least one or more turning vehicles, single vehicle accidents on the public roads and rear end collisions with a stationary vehicle or one that was slowing down. The girls most frequent type of accident was also the two vehicle accident where one or more of them were turning. The next two most frequent types of accident which, when combined, exceeded the number of turning accidents, involved only one vehicle manoeuvring off the public roads and on the public roads. Thus the implication appears to be that the structure of the roads presents difficulties to both the driver who is turning and the driver who is near a driver who is turning. In addition, relative to the amount of time spent turning, the design of the roads permit drivers to turn less easily than it permits the driver to maintain speed and direction.

Those people who were involved in an accident were also asked whether the presence of any other factors had contributed to the accident. In about 18% of the boys' accidents and 25% of the girls' accidents, they reported that the road design such as the camber or road furniture had affected the accident. It is difficult to interpret the weight that should be attached to these factors as contributing to the cause of the accident. The most interesting aspect is that the girls are more likely to attribute cause to the road environment than the boys. Since the girls had driven fewer miles than the boys, it may be hypothesised that it takes time and practice to see the implications of the road design for one's own behaviour, i.e. for the response to the environment to become automatic, and that the girls by virtue of their lack of practice are still at the stage when they can recognise the importance of the particular road feature but cannot yet translate this into action. The boys appear to be able to do this a little better. This seems a plausible explanation since the girls experienced more difficulty altering direction, i.e. with car control.

To a certain extent, the drivers' actions will be affected by the degree to which he knows the road. Of those who supplied information (this question was only included half way through the follow up studies), they were more likely to know the road well than not at all. There was little variation either within or between the boys' and girls' samples. This would tend to imply that the dynamic factors are probably more important than knowledge of the road configuration.

The accidents were more likely to take place within 15 miles of the driver's home. Only one third took place at a distance greater than this from home.

The girls' accidents were slightly more likely than the boys' accidents to take place nearer home. But these differences are not significant. When these findings are compared with the known distribution of journey length for each of the groups in 1974, it can be seen that more accidents occurred at a greater distance than 15 miles from home than could be expected for both boys and girls. The boys were more likely to be driving on longer journeys than the girls and this is reflected in the spatial distribution of accidents.

The purpose of this analysis of the road environment at the site of these young people's accidents was to ascertain whether it could indicate which type of situation is associated with the most accidents. Clearly the knowledge of what the environmental requirements in different types of traffic situations are and how they relate to the cognitive-behavioural process of driving would be useful in designing courses for learner drivers. In essence, this point of view accepts that the road situations which put heavy demands on the drivers' mental activity and performance and thereby increases the possibility for human errors, must be seen as defects in the road system. An important task in driver education will consequently be to enable the driver to compensate for these defects.

In addition, an attempt was made to see whether the distribution of accidents was in any way related to the known differences in driving practices. Apart from motorway driving, very little information was collected from the sample about the kinds of roads on which they did most of their driving. However, this analysis has served to clarify the nature of the data needed to relate accident frequency to driving practices.

5.4 Dynamic factors

The dynamic factors increase the complexity of the driving task by widening the driver/car/road system to include other traffic and road users. Therefore the driver/road/traffic system refers to the kinds of actions the driver is able to do within the traffic environment. The driver's ability to alter speed and direction are severely limited by the presence of other vehicles and pedestrians. Even within these two groups of road users, there are different constraints imposed by the different members of the group, e.g. a bicycle takes up less room on the road and moves more slowly than a lorry. Figure 5.1.1 lists the information collected from the drivers involved in an accident which might shed some light on the part played by dynamic factors in accident causation.

It can be seen from Table 5.1.1, that most of the boys' accidents (about 75%) involved at least one other vehicle. There was some variation within the boys' sample but this was not statistically significant. Table 5.1.2 shows the proportion of girls' accidents that were single vehicle accidents. About 30% were single vehicle accidents, i.e. a slightly higher proportion than that of the boys. Within the girls' sample, a higher proportion of the fully trained girls' accidents were single vehicle accidents and this difference was statistically significant at the 5% level. Thus, training is, in the girls' case, associated with a different type of accident. However, since the trained girls differed from the other groups with respect to mileage and the boys had driven more than the girls, it seems likely that these differences are due to variations in experience rather than training, i.e. the relationship between training and the type of accident is not a causal one but is due to association with a third variable, namely mileage.

Despite the fact that this sample of accidents includes very minor collisions and parking accidents, and is taken from the most unskilled phase of their driving career (the first few years after learning to drive), it is the presence of other traffic rather than car control or pedestrians which presents

the greatest difficulty, as reflected in the frequency of accidents. When the data relating to the type of vehicles which were also involved in the accident are examined, it can be seen that 75% of the accidents in the boys' sample and 60% girls' accidents, involved another car. Lorries and vans were less frequently involved. This may reflect the distribution of vehicle types on the roads today (D.O.E , 1973), but indicates that whatever the risk of being involved in an accident with a large vehicle relative to the number of large vehicles on the road, the absolute level of risk of being involved in an accident with another car is very much higher. This may be because the actions of a smaller vehicle which is more manoeuvrable are less predictable for the young drivers. Alternatively, it may be that lorries etc., by being larger and taking up more room on the road, appear to offer fewer opportunities and alternatives for the driver so that a car driver feels very much more restricted with respect to his future actions than he does when encountering another car and adjusts his speed and direction accordingly.

There are no very substantial variations within the boys' and girls' samples, although the variation between the two samples is statistically significant, i.e. the girls had significantly more accidents involving larger vehicles than the boys did. Since the two samples differ chiefly in the amount of driving experience, it may be reasoned that young drivers learn to avoid becoming involved in an accident with a lorry sooner than with a car. It seems likely that the manoeuvring characteristics of larger vehicles are so obviously different from those of smaller vehicles, e.g. a lorry has to move into the centre of the road and turn a sharp left hand corner, that they are soon learned by the novice driver. To the extent that this kind of accident is avoided as experience increases, it suggests that drivers learn to anticipate the movements of large vehicles and that this is the kind of information that a learner driver would benefit from receiving during his training period.

The two vehicle accidents were further examined in order to ascertain the kind of manoeuvre the other vehicle was carrying out. For both the boys' and the girls' sample, the other driver was, most frequently, turning or waiting to turn. The other two important categories were "making normal progress" and "slow down or stopping". Thus other traffic presented the greatest problems when changing or about to change direction. Since the boys and girls differed in their driving experience, their involvement with other vehicles when adjusted for mileage does in fact show that the boys were involved in fewer accidents per mile than the girls when the other vehicle was turning or making normal progress, and in a similar number of accidents per mile when the other vehicle was stopping or slowing down. This would tend to suggest that as experience increases, young drivers are better able to deal with other traffic which is turning or making normal progress, but that even after several years of driving, although the risk per mile is lower than the previous two kinds of accidents where other drivers are involved, the ability to avoid a rear-end collision does not appear to have been acquired.

When accidents involving pedestrians are considered, it can be seen that 6% of the boys' and the girls' accidents involved pedestrians. The numbers involved are so small that it is difficult to draw any conclusions about the relative difficulty posed by the activity of the pedestrian immediately prior to the accident for the driver other than to say that most of the pedestrians were crossing the road when the accident occurred. Again, despite the fact that the boys and girls differed in the amount of driving experience they had had, their involvement in an accident with a pedestrian, as a proportion of the total number of accidents, is identical. Thus it would appear that within the range of experience of this sample of young drivers, the more experienced drivers, particularly the boys, have not learned to avoid this kind of accident, i.e. driver behaviour vis a vis pedestrians does not appear to have changed.

Those people who were involved in an accident were also asked whether the presence of any other factors had contributed to the accident. In about 27% of the boys'and 19% of the girls' accidents, they reported that parked vehicles and other road users had contributed to the occurrence of the accident. There are two ways in which they can contribute to an accident. Firstly, they require a driver to alter his direction so as to avoid hitting them, and secondly they obscure the driver's vision of the road by masking other road users. Despite the boys' greater experience, they more frequently reported the incidence of parked cars and road users as contributing factors in the accident. It will be recalled that they were less likely than the girls to attribute some degree of responsibility for the accident to the road environment. It is difficult to attach a great deal of weight to the answers to this question, but it may indicate that the boys experienced greater difficulty with other road users than the girls and less difficulty with the road environment than the girls. This seems a plausible explanation, since they were involved in more accidents with at least one other vehicle than the girls were.

5.5 Informational factors

Informational factors are those factors which provide the driver with guidance as to how he should alter the speed and direction of his car. However this is the chief area in which our knowledge of all the circumstances at the time and place of the accident is deficient. Although the informational factors include such things as road markings, signs and signposts etc., these are the variables about which it is very difficult to get reliable information from the sample themselves since frequently drivers are not aware of having seen them. To get this kind of information in sufficient detail, it is necessary for a trained team to investigate the site of the accident as soon as possible after the accident has occurred. It can be seen from Figure 5.1.1 that little information which could throw some light on the part played by road markings, pedestrian crossings, traffic lights etc., was collected from the drivers who were involved in an accident. Consequently, although this is a promising area for accident investigations, analysis of the relationship of informational factors and accidents cannot be carried out in this study.

5.6 External factors

External factors are those factors which are external to the driver/car/road/traffic system, but nevertheless affect the activity of driving. Such factors include the light, weather, road conditions etc. In an attempt to assess the relative difficulty of the driving task in these different conditions, information about these factors at the time of the accident was collected from the sample. A complete list of these factors is shown under the appropriate heading in Figure 5.1.1.

The impact of darkness on the difficulty of the driving task will be investigated by comparing the incidence of day and night accidents. Table 5.1.1 shows the frequency distribution of accidents according to the degree of light for the boys' sample. It can be seen that slightly more than half of the boys' accidents occurred during the hours of daylight. When the groups are compared, it can be seen that the fully trained boys had fewer of their accidents during the day time and more at night time than the other groups. These differences were statistically significant at the 5% level. Thus training is associated with a larger proportion of night time accidents.

To a certain extent, this result could be expected since the fully trained group reported that they drove a greater proportion of their weekly mileage at night than the other groups. However, as their weekly mileage is lower than the other groups, the actual number of miles driven at night may not be higher than that of the other groups. Thus, the proportion of night accidents

appears to be related in a constant way to the proportion of night driving. On the other hand, since the trained group were also considerably less experienced as drivers, it may also be that this difference in the proportion of day and night accidents is accounted for by their different levels of experience. This would imply that night accidents decline with experience. If this is so, it would suggest that night driving presents more difficulty to the new driver than day time accidents and that the ability to drive safely at night is acquired more quickly than the ability to drive safely during the day time.

Table 5.1.2 shows the frequency distribution of accidents according to the degree of light for the girls' sample. Again, slightly more than half of the accidents took place during the day time and about one third at night. There are no substantial differences within the girls' sample. When the boys and girls are compared, it can be seen that the distributions of accidents according to the degree of light are very similar. When the boys and girls were compared with respect to the amount of night driving, it was found that the girls drove significantly less at night than did the boys. Not only did the girls drive a smaller proportion of their mileage at night than the boys but they also drove fewer miles at night than the boys. Thus, the fact that the proportion of night accidents is very similar to that of the boys would suggest that night driving is more difficult for inexperienced drivers than experienced drivers and that this skill improves fairly rapidly. (If the proportion of night accidents was related in a constant fashion to the proportion of night driving, then one would expect the girls to have a smaller proportion of night accidents than the boys).

It is interesting that according to these figures, night driving which is assumed to be a more difficult task than day time driving because of the lack of visibility, is found to be more difficult in relation to the amount of driving done at night for inexperienced drivers only. For the more experienced groups of drivers there is evidence that day time driving is more difficult than night driving, as measured by accident frequencies.

When the night accidents are compared on the basis of whether or not the streets were lit, it can be seen in the boys' case the ratio is slightly more than 3 accidents on streets with public lighting to 1 accident on streets without lighting, with the fully trained group (i.e. the least experienced group) having slightly more on unlit roads. The girls had slightly more than 2 accidents on streets with lighting for each accident on streets without lighting. This would tend to indicate that the very inexperienced drivers had more difficulty with night driving because of lack of visibility but that the ability to drive safely at night on streets without lighting increased with experience, i.e. drivers learn to adjust their driving to the situation imposed by reduced visibility.

Apart from the degree of lighting, one of the chief differences between day and night driving is the amount of traffic. Traffic flow at night is considerably lower than it is during the day time. The fact that the experienced drivers had more accidents during the day than during the night may indicate that they find it more difficult to drive in traffic conditions than in conditions of poor visibility. There was some evidence to suggest that it took longer to acquire the skill of driving in traffic than to control the car or to alter speed and direction according to the road configuration. The evidence presented here with respect to day and night accidents tends to substantiate this finding.

It is, of course, not entirely clear to what extent night accidents are caused by fatigue rather than lack of visibility. Data were collected from the sample relating to the time of day when the accident occurred. This is presented for each of the groups of boys and girls at the end of Table 5.1.2. It can be seen that accidents are distributed fairly evenly throughout the day

from 8.00 am until midnight with slightly more occurring at the evening peak travel period. If the assumption is made that these accidents which occur after 10.00 pm and before 3.00 am are likely to involve a driver who is tired, it can be seen that this period accounts for 13% of the accidents. Since it is usually dark or dusk by 10.00 pm, nearly all these accidents have taken place when visibility is poor. While it cannot be assumed that accidents that occurred before 10.00 pm did not involve a driver who was tired, it can be seen that lack of visibility provides a more plausible explanation for most of the 46% of accidents occurring at dusk and at night. Likewise, since the 10.00 pm - 3.00 am period is the one most likely to include drivers who have been drinking, it can be seen that this does not account for the majority of dusk and night accidents for this sample of young people.

Another factor external to the driver/car/road/traffic system which may affect the activity of driving is the weather. Information relating to the weather conditions at the time of the accident was therefore collected. It can be seen from Tables 5.1.1 and 5.1.2 that about 70% of all accidents occurred when there were no adverse weather conditions and about 25% occurred when it was raining. There were no differences within or between the boys' and girls' sample. It is of course not known the extent to which the various groups drove in different weather conditions and whether there were any variations between the groups. It is therefore difficult to relate it to their exposure to risk. However, the most remarkable feature of these tables is the similarity of the accident distributions with respect to weather conditions, despite the difference in levels of experience. If the groups' exposure to risk with respect to weather conditions (i.e. raining or not raining) is broadly similar and there seems no reason to expect it to differ (although this might be expected for the more extreme weather conditions such as fog and ice), then it would appear that drivers do not appear to adjust their driving to the new situation imposed by the change in the weather (as reflected in accident frequency). This would appear to be one area where learning has not taken place.

The sample were also asked to provide information about the road conditions at the time of the accident. It can be seen that about 60% of the boys' accidents took place on dry roads and 35% on wet or greasy roads. The figures for the girls' accidents are 67% and 29%. The differences between and within the boys' and girls' sample are not significant. Thus, these data confirm the finding noted above, namely that driver behaviour in wet conditions, as reflected in accident frequency, does not appear to alter as experience increases.

It can be seen that the proportion of accidents occurring on wet and greasy roads is higher than the proportion of accidents occurring when it was raining. This increase is a fairly constant 8-10% for all the groups in the sample. This appears to indicate that not only do these young drivers not adapt their behaviour (as measured by accidents) or adapt it sufficiently to avoid becoming involved in an accident, according to the weather but they also pay less attention to the condition of the road surface irrespective of the weather prevailing at the time of the accident.

Those people who were involved in an accident were also asked whether the presence of any other factors had contributed to the accident. In about 1% of the boys' accidents and 4% of the girls' accidents, they reported that factors external to the car/road/traffic system had contributed to the accident. For example, one girl reported that she drove into a beer barrel which had fallen off the lorry in front of her. Thus, these other factors appeared to have contributed very little to the accident frequency.

5.7 The condition of the driver

A further factor that needs to be considered in the driver/car/road traffic system is the condition of the driver himself. In fact, most of the accident research is characterised by an explicit concern with the driver himself (albeit, often divorced from the activity of driving). This research includes studies of the drivers' attitudes, personality, medical history, vision and his impairment due to alcohol, drugs, fatigue etc. Information regarding a few of these factors and several others was collected from those people who were involved in an accident. Those factors which are thought to relate to the condition of the driver are shown in Figure 5.1.1. It can be seen that most of the information relates to the knowledge the driver had about his car, the road, and the activity of driving.

To a certain extent, the drivers' actions will be affected by the degree to which he is familiar with his car's capabilities. In an attempt to ascertain the part played by this in safe driving, all accident involved drivers were asked whether the accident occurred while driving the car they usually drove. Table 5.1.1 shows that the drivers' lack of familiarity with the car at the time of the accident was associated with 11% boys' accidents. Within the boys' sample, there was little variation. Only 6% girls' accidents occurred while the girls were driving a different car to the one they usually drove. This was more likely to be a factor in the pre-driver trained group than in any of the other groups. Lack of familiarity with the car was more frequently associated with the boys' accidents than the girls' accidents.

It is difficult to ascertain the degree to which lack of familiarity with the car is important since it is not known the extent to which the sample as a whole drove cars other than their usual one. In any event, the girls were less likely to own the car they usually drove and drove fewer miles per week than the boys, yet lack of familiarity with the car was reported less often by the girls. For the most part, accidents occurred in the car they usually drove as could be expected on the basis of mileage alone. It seems likely that in relation to the mileage driven in the 'unfamiliar' car, that the number of such accidents is higher than in the car they usually drove.

The drivers were also asked the purpose of the trip they were making when the accident occurred since it was thought that this might be related to his condition at the time of driving. The majority of the boys' accidents (68%) occurred when making a trip for social, domestic or pleasure purposes. Commuting accidents accounted for 16% and accidents before passing the licensing test accounted for 5%. There was little variation within the groups and the girls' sample of accidents did not differ very much from these. In relation to their known driving practices in 1974, the accidents occurring when making a social/domestic/pleasure trip were slightly overrepresented and the commuting accidents were under-represented. However these differences are not very large and relate to different time periods. The girls had a slightly greater proportion of their accidents before passing the test than the boys. This may indicate their lower initial levels of skill at performing a complex psychomotor task. Generally speaking, there is no evidence to suggest that the purpose of the journey a driver makes (and its implications for the choice of route, time of day, length etc) has any effect on the driver's condition as reflected in accident rates. There is no evidence that the type of journey, as defined in these terms, implies a different degree of risk. It would suggest that skill in driving is acquired cumulatively over all types of journeys although there is evidence that certain aspects of the driving task take longer to learn than others.

Accidents were compared according to the time of day when they occurred, in order to throw some light on the part played by fatigue in accident

causation. It was found that accidents are distributed fairly evenly throughout the day from 8.00 am until midnight with slightly more occurring at the evening peak period. If the assumption is made that those accidents which occur between 10.00 pm and 3.00 am are likely to involve a driver who is tired (although it is impossible to separate the effect of fatigue from the lack of visibility when driving at night), it can be seen that this period accounts for 13% of the accidents in both the boys' and girls' accidents. In so far as the boys and girls differ with respect to their driving experience and proportion of night driving, and yet the proportion of late night accidents do not, it would suggest that more experienced drivers are better able to compensate for the effects of fatigue (if indeed that is what is being measured).

However, since the 10.00 pm - 3.00 am period is also the one when drivers are most likely to be drinking, it is not clear whether these accidents are primarily due to lack of visibility, fatigue or alcohol or some combination of these. Alcohol was found to be a factor in 15% boys' accidents and 10% girls' accidents, i.e. one of the drivers involved in the accident, his passengers or the pedestrian had been drinking. In 8% of the boys' accidents and 4% of the girls' accidents the driver in our sample had been drinking prior to the accident. There are no significant differences within the boys' and girls' samples, or between them.

To a certain extent, the drivers' actions will be affected by the degree to which he knows the road. Of those who supplied information (this question was only included half way through the follow up studies), they were more likely to know the road well than not at all. This would imply that the dynamic factors are probably more important than the knowledge of the road configuration. There was little variation either within or between the boys' and girls' samples.

The accidents were more likely to take place within 15 miles of the driver's home. Only one third took place at a distance greater than this from home. The girls' accidents were slightly more likely to take place nearer home than the boys' accidents. But these differences were not significant. When these findings are compared with the known distribution of journey length for each of the groups in 1974, it can be seen that more accidents occurred at a distance greater than 15 miles from home than could be expected for both boys and girls. The boys were more likely to be driving on longer journeys than the girls and this is reflected in the spatial distribution of accidents.

The drivers who were involved in an accident were asked if they thought that a lapse of attention on their part was a contributing factor in the accident. Since the question was only asked of about half of those involved in accidents, the data are not complete. Only about one third thought that their attention had wandered. In most cases, they could only say that their attention must have wandered since they did not see the accident develop, but they were unable to say what had distracted them.

Three other factors relating to the condition of the driver which are known to affect his behaviour as a driver, firstly with respect to his interaction with the car, and secondly with the activity of driving itself, are age, experience and mileage. These variables and the way they affect driver behaviour have already been examined elsewhere.

5.8 Conclusions

The analyses presented in this chapter have attempted to look at the attendant circumstances of the accidents in which this sample of young people were involved to see what they can tell us about the nature of the driving task, the different components of the driving task, their different levels of complexity and the implications for training. The first problem is, as has been stated several

already, that accidents are not behavioural measures and are being used as surrogates for behaviour although the relationship has not been validated. A further problem is the departure from the ideal amount of information about the accidents. In addition, since the majority of accidents reported did not have very great consequences, it is not clear the extent to which findings relating to trivial accidents can be generalised to those with more serious outcomes.

Much of the previous research into accidents has concentrated on the individual driver and his personal characteristics in isolation from the activity of driving. Comparisons between accident countermeasures were therefore expressed in terms of the number of accidents per driver. It then became clear that one could not talk about an individual's involvement in road accidents without relating it to exposure to risk. It has therefore become the practice to compare accident frequencies on the basis of the number of accidents per mile travelled. Clearly however, mileage represents a very crude estimate of the extent of a driver's exposure to risk.

This study of young people's accidents has compared boys' and girls' accidents. It seems reasonable to assume, on the basis of previous evidence, that the chief way in which these two samples differ is in levels of driving experience. By comparing groups who have received different forms of training, who have had different amounts of driving experience and whose patterns of interaction with the car are known to be slightly different, it has been shown that there are differences between the groups' involvement in accidents. The nature of the relationship is not always very clear but there is evidence that involvement in certain types of accidents is dependent on certain types of exposure to risk. In addition, there is some evidence that certain aspects of the driving task are acquired more quickly than others.

By showing such a relationship between accident involvement, exposure to risk and previous driving experience, this study has widened our understanding of the concept of exposure to risk. Although this analysis of the attendant circumstances of the accidents has been at a fairly superficial level, the results indicate the importance of looking more carefully at the exposure to risk data collected at six month intervals during the follow up studies and examining the way driving practices alter as experience increases. Until such a time series analysis has been done, there is little point in examining the accident data in more detail. It had been intended to carry out a similar analysis for the incidents that gave rise to traffic offences. But given this relationship, it seems worthwhile to delay this until the exposure to risk analyses have been completed.

It is important to examine the way young people interact with the car and to compare groups of boys and girls who have received different forms of training so as to ascertain the way a particular piece of technology, such as the car, structures the activities of those who use it. There was evidence to suggest that apart from weekly mileage, when only those who usually drive are compared, their exposure to risk is very similar. Thus access to a car was the critical factor in determining exposure to risk. Once a young person had access to a car, there was very little variation in the way it was used. This in turn implies that the factors affecting access to a car are important. These were found to be due chiefly to cultural and socio-economic status factors.

Without an understanding of the way the young driver interacts with the car and acquires experience and the way his activities vis a vis the car change, it will not be possible to know which aspects of the young driver's behaviour are modifiable. The availability of a sample made up of boys and girls who have received different forms of training permit an investigation to be made of changes in behaviour. In addition, without any knowledge of which aspects

of behaviour develop autonomously from owning and driving a car and are therefore invariant across different groups of drivers, it will be impossible to devise successful training courses for young drivers.

For many years, education and training have been the rag-bag category or panacea for a variety of social evils. It is only now that we are beginning to see that there are other factors which will influence the responsiveness to education, e.g. home background, peer groups etc., and which may negate the effects of education or even subvert it. If driver training is to be effective, it must be based on an understanding of the way the car structures the activities of the driver, not only when he is driving but also the kinds of decisions he makes and his interaction with the car.

Since in addition to the exposure to risk data and the details of the sample's accidents, data relating to 300 of these young people's driving performance are also available, it is possible to investigate the relationship between the drivers' interaction with the car, and the activity of driving and accidents. Thus, it may be possible to discern what and how the young driver learns in order to become a safe driver.

CHAPTER SIX THE EFFECT OF A COURSE OF DRIVER EDUCATION ON INVOLVEMENT IN TRAFFIC OFFENCES

The use of traffic offences as a criterion of driving performance and therefore of the effectiveness of driver education is subject to as many limitations as the use of accidents. Namely that it is a matter of chance (i.e. it is not 100% certain) whether one is charged with a traffic offence for breaking one of the laws relating to driving given the frequency with which the law is generally disregarded in this area. Chance operates at several points in time. The particular infraction of the law must usually have been observed by the police. In some cases, the police chose not to pursue the matter any further. In other cases, not only the particular infraction which was initially observed gives rise to a charge, but also a secondary charge which may not originally have been apparent, e.g. faulty tyres or no insurance. In addition a person may be charged with several offences relating to the same incident and violation of the law. Since the police are required to give notice within fourteen days of the intention to prosecute, some people are served with a notice but their cases never come to court because the police reconsidered their decision. The outcome in court of most of the less serious offences is usually predictable, since they are generally a question of fact, e.g. speeding or no provisional licence. They are rarely contested unless it is a third offence within a three year period which would result in a disqualification. The more serious are usually contested and are subject to the decision of a magistrate or jury.

Thus it can be seen that traffic offences are not a very reliable criterion. Relatively few illegal acts of driving behaviour result in a charge, and of these, the worst acts of driving come to light because of an accident. Of the 285 cases of dangerous driving studied by Willett (1964) 71% came to light as a result of an accident. Nevertheless they do provide an additional source of corroborative evidence about a person's driving behaviour. Like accidents, traffic offences imply that the driver has carried out an unsafe or potentially unsafe act. However, they do not necessarily imply that those who have not been charged with traffic offences are better drivers. Perhaps traffic offences should be viewed in this study, as another assessment of driving performance where the police are the assessors.

If traffic offences are viewed in this light, the incident which gave rise to one or more traffic offences is taken as the criterion of the effectiveness of driver education, rather than the total number of charges or the total number of convictions. Initially the incidents will be used as the criteria. Subsequently the number of charges and convictions will be considered. In addition the type of traffic offence will also be considered. Traffic offences cover a wide range of matters relating to driving as can be seen from Table 6.1.1 which also shows the penalties associated with them. Each offence (and there may have been several arising from one incident) was coded according to this classification.

This section studies the students' involvement in prosecution for motoring offences and attempts to assess the effect of driver education. The method of analysis is very similar to that used for the accident investigation in order to permit comparisons to be made between accidents and traffic offences. The relationship between these two criteria of driving performance is considered in detail and has important implications for the design of new research. Several new approaches are suggested.

6.1 The relationship between a course of driver education and the number of incidents where traffic offences occurred

In order to isolate the effect of a course of driver education on traffic offence involvement, as many variables as possible will also be examined for their effect on the likelihood of being charged with a traffic offence. In

Table 6.1.1: Traffic offences and their penalties

The Road Traffic Act 1960 and 1962 and the Road Safety Act 1967 are measures which contain provisions designed to make the roads safer. Under the 1962 Act disqualification plays a much greater part in the system and may be ordered for a much wider range of offences. And a special penalty was introduced for anyone convicted three times in three years of any of the more serious traffic offences.

How the penalty system works

THE MOST SERIOUS OFFENCES

(A) Automatic Disqualification for at least one year

A driver is automatically disqualified for at least one year if convicted of any of the following six offences (but see Part 1):

Code	Offence
21	Manslaughter (in Scotland culpable homicide)
22	Causing death by dangerous driving
23	Dangerous driving committed within three years of a previous conviction of dangerous driving or of causing death by dangerous driving.
24	Driving under the influence of drink or drugs, or driving with a blood-alcohol concentration above the prescribed limit of 80 milligrammes of alcohol in 100 millilitres of blood.
25	Racing on the highway.
26	Driving while disqualified.

DANGEROUS BEHAVIOUR OFFENCES

(B) Disqualification at Discretion of the Court

A driver can be disqualified for such periods as the court decides on conviction of any of the following 20 offences:

Code	Offence
01	Dangerous driving.
02	Careless driving.
03	Speeding.
04	Driving under age.
05	Being in charge of a vehicle whilst under the influence of drink or drugs.
06	Improper carriage of passengers on a motor-cycle.
07	Failure to comply with directions of a police constable or with prescribed traffic signs or signals.
08	Leaving a vehicle in a dangerous position.
09	Contravention of traffic regulations on special roads such as motorways etc.
10	Contravention of pedestrian crossing regulations.

Code	Offence
11	Failure to obey a sign exhibited by a school crossing patrol.
12	Contravention of a street playground order.
13	Certain contraventions of the construction and use regulations, including the new tyre regulations governing the condition of tyres fitted to a vehicle, and the use of faulty brakes and steering gear.
14	Failure to stop after an accident.
15	Driving without a licence valid for the particular vehicle or driving by a learner without a provisional licence and without L plates etc:
16	Failure to comply with the conditions of a provisional licence.
17	Use of a motor vehicle uninsured or unsecured against third party risks.
18	Taking a motor vehicle without authority.
19	Driving with uncorrected defective eyesight or refusing to submit to a test to establish eyesight requirements.
20	Stealing a motor vehicle.

ENDORSEMENT

Anyone convicted of any of these offences mentioned will normally have the particulars endorsed on his licence by the court. If he is also disqualified, particulars of the disqualification will be endorsed on his licence. But if he is not disqualified the court may find special reasons for not ordering particulars of the conviction to be endorsed.

"THREE IN THREE YEARS"

(C) Automatic Disqualification for at least six months

A driver is automatically disqualified for at least six months if convicted three times in three years of any of the 20 offences listed in Parts A and B (but see Part D).

For example, the three convictions could be for driving under the influence of drink, speeding and contravening the pedestrian crossing regulations. The automatic disqualification is to be ordered at the time of the third conviction. It will be on top of any disqualification ordered on conviction of the third offence itself.

DRIVERS' SAFEGUARDS

(D) Special cases

Only in certain circumstances can a court impose a shorter period of disqualification or not order disqualification for offences under Part A or Part C. For offences under Part A this can happen when the court finds special reasons. For offences under Part C this can happen when the court is satisfied, having regard to all the circumstances, that there are grounds for mitigating the normal consequence of the conviction. Except for this the court is obliged to order disqualification for at least six months.

Drinking and Driving

Conviction of a second or subsequent offence of driving under the influence of drink has a special penalty. If the previous conviction took place within ten years of the offence, the offender must be disqualified for at least three years.

Other Penalties

Apart from disqualification, courts may impose a fine and, for certain offences, imprisonment. The maximum fine for most of the offences in Parts A and B is £100.

the initial stages of the analysis, the total number of charges will be considered as a whole, rather than subdividing them on the basis of severity or any other classification. This will enable a broad comparison to be made with American results and of course simplifies the analysis. Subsequently they will be subdivided and considered in smaller groups. A comparison of these results will show whether it is reasonable to treat traffic offences as homogeneous events.

Previous American studies have been criticised because of the volunteer bias in the fully trained group which worked in their favour. This study has also been shown to have a bias in the fully trained group in that it consists of younger, less experienced drivers and that those who usually drove (although not the group as a whole) had a different occupational status than the other groups.

Table 6.1.2 shows the number of incidents which gave rise to prosecutions as reported by the various groups of boys and girls. The control boys reported the highest number in the boys' sample and the fully trained girls reported the highest number in the girls' sample. The most obvious point is that the girls reported very few traffic offences. In all, 208 offences were reported during the six years of the follow up studies - more than half of which were reported in the latter two years of the project.

Table 6.1.3 shows the average number of incidents per driver in each of the boys' and girls' groups. It can be seen that the fully trained boys had fewer incidents than any of the other groups - the pre-driver trained boys had the highest rate per driver. These differences were statistically significant. In the girls' sample, the pre-driver trained group had the worst record and the control group had the best record but these differences were not sufficiently large to achieve statistical significance. All the girls reported fewer incidents than did their male counterparts and with the exception of the small simulator trained groups, these differences were significant. In all cases, these rates were higher than those observed in the previous analysis (Shaoul, 1972).

Once again, if one takes the number of occasions on which the sample were charged with a traffic offence as a criterion, the fully trained boys' group have the best record. Yet a course of 30 + 5 is apparently worse than no formal instruction. Again, this finding is contrary to the findings of the early American research on driver training. However these results are consistent with the effects of driver education with respect to accidents. Previous American research showed that driver education was similarly effective with both accidents and traffic offences. However at this stage of the analysis, the conclusioncannot yet be drawn that driver education has had a beneficial effect on young drivers with respect to traffic offences.

6.2 The relationship between a course of driver education and the distribution of traffic offences among drivers

Although it appears that a course in driver education was associated with a lower probability of being involved in driving practices which gave rise to prosecutions, for the group as a whole, the likelihood of any one individual being thus involved has not been shown to be effected. Since it is relatively rare for poor driving standards to give rise to a traffic offence, it might be argued that some people are better at escaping detection than others. The higher number of traffic offences in the pre-driver and control boys' groups could be accounted for by fewer people being charged more often.

Table 6.2.1 shows the frequency distribution and percentage frequency distribution of traffic offences per driver for each of the four groups of

TABLE 6.1.2 THE NUMBER OF INCIDENTS IN EACH OF THE GROUPS

Number of incidents	Pre	Control	Full	Sim	Total
Boys	45	77	62	4	188
Girls	2	7	10	1	20
Total	47	84	72	5	208

TABLE 6.1.3 THE INCIDENT RATE PER DRIVER

Number of incidents	Predriver	Control	Full	Simulator	Total	X^2
Boys:						
number of drivers	91	244	216	14	565	
incidents	45	77	62	4	188	
rate	0.473	0.314	0.288	0.286	0.330	$p < 0.05$
Girls:						
number of drivers	23	175	138	15	351	
incidents	2	7	10	1	20	
rate	0.083	0.041	0.073	0.067	0.057	$p > 0.05$
Total:						
number of drivers	114	419	354	29	916	
incidents	47	84	72	5	208	
rate	0.412	0.200	0.203	0.172	0.227	$p < 0.05$
X^2 boy/girl differential	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p > 0.05$	$p < 0.05$	

boys. It can be seen that slightly fewer of the fully trained boys had even been charged, than any of the other groups. Not only had more of the pre-driver trained boys been charged but they were also slightly more likely to be charged more than once. However a chi-square test showed that these differences were not statistically significant at the 5% level. It cannot therefore be said that the driver trained students were less likely to be prosecuted for a traffic offence. Again, comparing these results with those obtained earlier in the study, more young people had been charged with a traffic offence.

Table 6.2.2 shows the frequency distribution and percentage frequency distribution of traffic offences per driver for each of the four groups of girls. The control girls were more likely to be traffic offence free but the differences are very small indeed and do not achieve statistical significance. When the boys and girls are compared, not only are the girls less likely to be involved in an incident resulting in prosecution, they are also less likely to be involved in more than one such event. These differences are significant.

This, to a certain extent, tends to explain the findings of the previous section; namely that the significantly higher incident rate per driver per member of the pre-driver trained boys is accounted for by slightly more incidents per person within the group. The girls had fewer incidents per group because they were less likely to be charged on more than one occasion. This superior record may indicate a superior driving performance or it may be a result of their driving fewer miles than the boys. Thus it can be seen that great care has to be taken in the exact definition of the prosecution rates to be used when comparing groups. To conclude, the better record of the driver trained groups (as measured by the average prosecution rate) is somewhat illusory and is accounted for by fewer traffic offence repeaters. For discrete data, such as prosecutions, the average obscures more than it reveals.

When these results are compared with those obtained in an earlier analysis, it can be seen that the differences between the proportions of male drivers who had been charged with one or more traffic offence (in favour of those who had received the full course of driver education) have disappeared. (No differences were apparent within the girls' sample). The previous differences in prosecutions were accounted for by factors other than driver education and appear to be somewhat transient.

As it has been shown that not all those who have a full licence to drive, actually drive, these prosecution rates were adjusted for the number who reported that they usually drove. Table 6.2.3 compares the percentage of boys and girls in each group who had been charged, when an adjustment is made for the number who say that they usually drive. Although this estimate of the number of actual drivers is probably not very accurate and does not preclude the possibility that they may have driven in the past and been charged with a traffic offence, it is nevertheless some indication of the number of people who drive. It can be seen that fewer of the fully trained boys were charged than any of the other groups. This difference was large enough to reach statistical significance at the 5% level. Thus, training is associated with fewer prosecutions for driving offences, when adjustment is made for the number who usually drive. In addition, the same situation obtains, namely that the pre-driver trained group had more traffic offences than the other groups. When the girls' groups are compared, the control girls, as in the earlier comparisons made in this section, have the best record although again the differences are not significant, when adjustment is made for the number who usually drive. When the boys and girls are compared on this basis, the girls are still less likely to be charged with a traffic offence than the boys are.

When these rates are compared with Tables 6.2.1 and 6.2.2, it can be seen that fewer of the drivers have not been prosecuted. Thus prosecutions are

TABLE 6.2.1 PERCENTAGE OF DRIVERS IN EACH OF THE BOYS' GROUPS WHO HAD BEEN CHARGED WITH A TRAFFIC OFFENCE

BOYS	Predriver		Control		Fully trained		Simulator		Total		X^2
Total no of drivers	91		244		216		14		565		
No of drivers not charged with offence	64	70%	180	74%	169	78%	11	79%	424	75%	$p > 0.05$
No charged with one offence	17	19%	54	22%	34	16%	2	14%	107	19%	
two offences	8	9%	8	3%	11	5%	1	7%	28	5%	
three offences	1	1%	2	1%	2	1%	0	0%	5	1%	
four offences	1	1%	0	0%	0	0%	0	0%	1	0%	

TABLE 6.2.2 PERCENTAGE OF DRIVERS IN EACH OF THE GIRLS' GROUPS WHO HAD BEEN CHARGED WITH A TRAFFIC OFFENCE

GIRLS	Predriver		Control		Fully trained		Simulator		Total		X^2
Total no of drivers	23		175		138		15		351		
No of drivers not charged with offence	21	91%	169	97%	129	93%	14	93%	333	95%	$p > 0.05$
No charged with one offence	2	9%	5	3%	8	6%	1	7%	16	5%	
two offences	0	0%	1	0%	1	1%	0	0%	2	0%	

TABLE 6.2.3 PERCENTAGE OF DRIVERS WHO WERE CHARGED WITH A TRAFFIC OFFENCE ADJUSTED FOR THE NUMBER WHO USUALLY DROVE

	Predriver		Control		Fully trained		Simulator		Total		X^2
BOYS											
No who usually drove	73		202		168		11		454		
No charged with a traffic offence	27	37%	64	32%	47	28%	3	27%	141	31%	$p < 0.05$
No not charged with a traffic offence	46	63%	138	68%	121	72%	8	73%	313	69%	
GIRLS											
No who usually drove	16		112		80		12		220		
No charged with a traffic offence	2	13%	6	5%	9	11%	1	8%	18	8%	$p > 0.05$
No not charged with a traffic offence	14	87%	106	95%	71	89%	11	92%	202	92%	

Table 6.2.4 : Comparison of observed and expected frequency distribution (Poisson) of traffic offences among male drivers

BOYS	Predriver		Control		Fully trained		Simulator		Total	
Total number of drivers	91		244		216		14		565	
	O	E	O	E	O	E	O	E	O	E
No.of drivers not charged	64	55	180	178	169	162	11	11	424	407
Number charged with one offence	17	27	54	56	34	46	2	3	107	134
" two offences	8	7	8	9	11	7	1	0	28	21
" three offences	1	1	2	1	2	1	0	0	5	2
" four offences	1	0	0	0	0	0	0	0	1	1
χ^2	6.6		1.4		6.7		0.3		10.33	
no.of degrees of freedom	3		2		2		1		3	
P	>0.05		>0.05		<0.05		>0.05		<0.05	

Table 6.2.5 : Comparison of observed and expected frequency distribution (Poisson) of traffic offences among female drivers

GIRLS	Predriver		Control		Fully trained		Simulator		Total	
Total number of drivers	23		175		138		15		351	
	O	E	O	E	O	E	O	E	O	E
No.of drivers not charged	21	21	169	166	129	127	14	14	333	333
Number charged with one offence	1	1	4	8	9	10	1	1	16	17
" two offences	0	0	1	1	1	1	0	0	2	1
χ^2	0.0		1.0		0.5		0.0		0.0	
No.of degrees of freedom	1		1		1		1		1	
P	>0.05		>0.05		>0.05		>0.05		>0.05	

related to whether or not one has been driving and the more a group drives, the more likely it is to be prosecuted. This tends to suggest that it may not be very meaningful to discuss traffic offences in relation to the driver but rather in relation to the amount of driving he does, i.e. his exposure to risk.

Tables 6.2.1 and 6.2.2 were further examined in order to ascertain whether the probability of an individual being charged was greater than could be expected by chance. If the distribution among drivers is entirely random, then one would expect the distribution to be approximately the same as the Poisson distribution which is based on the concept of equal liability. Tables 6.2.4 and 6.2.5 show the observed and expected frequencies for each of the boys' and girls' groups respectively. The degrees of freedom to be attached to the x^2 values shown in the tables need careful attention. The number of degrees of freedom is usually one less than the number of categories employed. But in fitting the Poisson distribution, the parameter m had to be estimated from the data themselves and this utilises a further degree of freedom. Therefore the tables show the number of degrees of freedom and the probability of the obtained value of x^2 exceeding the tabled value with the appropriate number of degrees of freedom. It can be seen that in no case were the distributions different from the Poisson, i.e. the Poisson distribution fitted the data well.

The conclusion must therefore be drawn that an individual's chance of being charged with a traffic offence is entirely due to chance and that training has little effect on this. There is no evidence to suggest that there are any individuals who are more likely to be prosecuted than others by virtue of their personality or other factors. These results tend to suggest that while many factors may interact to cause an individual to be prosecuted and to affect the overall number of such prosecutions, the number of prosecutions per person is entirely due to chance.

In so far as the individual driver's involvement in incidents giving rise to traffic offences appears to be entirely random, it would suggest that there is little to be gained at this stage by investigating the characteristics of the driver as an individual. Such results relating to the comparison of prosecution rates for the group of drivers as a whole and for those who actually drive, suggest that a more fruitful line of investigation would be into the activity of driving, i.e. a study of the individual's involvement in prosecutions relative to the amount of driving he does.

6.3 The relationship between a course of driver education and the number of traffic offences per mile

Since the fully trained groups were shown to have driven fewer miles than the other groups and this accounted for their superior accident record per driver, it is possible that their superior record with respect to traffic offences may also be accounted for in this way. Therefore incident rates per 1,000 miles were calculated and compared in order to assess the effect of mileage travelled on the number of traffic offences. In this way, it may be possible to determine the nature of the relationship between training and traffic offences.

Table 6.3.1 shows the incident rate per 1,000 miles for each of the boys' and girls' groups. It can be seen that there is very little variation between any of the boys' groups. The differences are insignificant. Thus the superiority of the fully trained group with respect to prosecutions disappears and is therefore entirely accounted for by a lower mileage. There is a greater variation in the girls' rate with the fully trained girls having the highest number of traffic offences per mile and the control girls the lowest.

These differences were significant. Thus training is associated in the girls' case with a higher number of prosecutions.

When the boys and girls are compared, it can be seen that the girls have fewer incidents per mile than the boys. These differences were significant for two of the groups - namely the pre-driver trained and control groups and for the two samples when the groups were combined. When these results are compared with those found in the earlier analysis, it can be seen these rates are substantially lower for all the groups thereby confirming the role of exposure to risk in the ability to avoid the unsafe practices which may result in prosecutions. On the other hand, it also suggests that these rates are not stable and raises the question whether they can serve as reliable criteria for program effectiveness.

The major implication of these findings is to establish that the nature of the relationship between training and traffic offences is not a direct causal one but rather one of association with a third variable, namely mileage, associated in different quantities with the different forms of training. Figures 6.3.1 and 6.3.2 show the frequency distribution of traffic offences and mileage for the boys and girls respectively in graphical form. The relationship between mileage and prosecutions is immediately apparent.

As it has been shown earlier that this mileage rate is not an accurate predictor of accidents, it is possible that the same also applies for traffic offences - if this is so, it is possible that the average incident rate per mile is obscuring the effects of training in this case. Table 6.3.2 shows the incident rate per 5,000 miles travelled. From this it can be seen that the incident rate declines with every 5,000 miles covered. In other words, the risk declines with experience.

Figure 6.3.3 shows the traffic offence rates for each range of 5,000 miles driven for each of the boys' groups more graphically, (since there were so few traffic offences reported by the girls, a similar graph has not been included for the girls). There is a certain amount of variation between the various groups of boys' traffic offence rates, but only within the 0 - 5,000 mileage range are these differences significant. At this level of experience, the control group had the worst record and the trained groups had the best record. Thus training seems to have some effect in the short term on the traffic offence rate in the first 5,000 miles of driving experience.

The downward trend in the girls' traffic offence rates as experience increases is also apparent, although it is not so marked. In most cases, the fully trained girls tended to have more prosecutions per mile. In addition their mileage within each range was half that of the control groups - thus they were considerably less experienced than the control girls. However at no levels of experience are the differences between the groups significant. At every range of experience, the girls have fewer traffic offences than the boys and this is significant in the 0 - 5,000 and 11 - 15,000 miles ranges.

Thus it would appear that the girls' driving performance as measured by the lack of traffic offences is superior to that of the boys. To what extent this may be due to their different driving patterns rather than actual driving performance cannot be ascertained at this stage. It will be recalled that although the girls were involved in significantly more accidents per mile than the boys, the kind of accident in which they were involved was usually slow speed manoeuvres. They were involved in fewer injury accidents per mile than the boys. To a certain extent, the larger number of prosecutions among the boys may be due to the fact that they arose out of accidents - this will be examined later. At this stage however it does appear that the kind of driving they do is not only less likely to involve them in injury accidents

but also in traffic offences. To this extent then, the use of traffic offences as a criterion has been shown to be consistent with the chief criterion - namely injury accidents.

The fact that the boys' and girls' incident rates declined with experience was contrary to what one would expect from the previously calculated average incident rate per mile which implies a constant rate. The null hypothesis of equality between the incident rates was tested. The incident rates per 5,000 miles range travelled were not found to be the same for all ranges of mileage for the boys' sample as a whole and for some of the boys' groups. In other words, the linear incident rate per mile is not accurate enough in predicting the incident rate for different ranges of experience.

For the girls' sample, the null hypothesis of equality between the incident rates also had to be rejected, although in no case could this hypothesis be rejected for any of the four groups. The differences between the boys' and girls' prosecution rates were significant in the 0-5,000 and 11-15,000 mile ranges. Figure 6.3.4 shows the observed and expected incident frequencies per 5,000 mile range. It can be seen that the decline in the slope of the curve of the expected number of traffic offences is much more gradual than is actually observed when mileage is considered.

The traffic offence rate per mile is a more relevant criterion than the rate per driver, since it does, to a certain extent, allow for exposure to risk. The trained group's superiority in the boys' case is no longer apparent. Likewise, the trained girls' inferior record could be explained by less experience than the other groups. However even the average traffic offence rate per mile does not accurately represent the group's relative ability to avoid prosecutions. This was found to increase with experience. In addition it was found that within the first few thousand miles, driver education appeared to play a positive part in influencing this ability in the boys' sample.

The results are particularly interesting because in the analysis carried out in 1972, the traffic offence rates (all traffic offences) were not observed to decline with experience, although the frequency of certain types of offences did decline with experience. This raised questions about the usefulness of traffic offences as a criterion since they did not appear to follow the same overall trend as accidents. By increasing the length of the follow up studies, the sample of traffic offences has increased and has still been found to follow the same overall pattern as accidents.

6.4 The relationship between a course of driver education and the number of traffic offences per month of driving experience

It has been shown earlier (Shaoul, 1975) that the fully trained group were more likely to be driving irregularly and at infrequent intervals than any of the other groups and that this pattern of driving was more characteristic of the girls' driving than the boys'. When their mileage was adjusted for the opportunity to drive, it was found to be lower than for the other groups. In order to see whether this had any effect on the number of traffic offences, the traffic offence rates per month of driving experience were calculated.

Table 6.4.1 shows the average incident rate per month of experience for each of the boys' and girls' groups. It can be seen that once again, the fully trained boys appear to have the best record within the boys' sample. However this difference was not significant, i.e. the superiority of the trained group with respect to the number of traffic offences can be explained by the groups' different levels of experience. There is a little variation in the girls' rates and again these were found to be non-significant. The

TABLE 6.3.1 INCIDENT RATE PER 1000 MILES

	Predriver	Control	Full	Simulator	Total	X^2
Boys:						
incidents	45	77	62	4	188	
total miles ('000)	2732	5236	3998	348	12314	
incident rate	0.016	0.015	0.016	0.014	0.015	$p > 0.05$
Girls:						
incidents	2	7	10	1	20	
total miles ('000)	258	1448	598	158	2462	
incident rate	0.008	0.005	0.017	0.006	0.008	$p < 0.05$
X^2 boy/girl differential	$p < 0.05$	$p < 0.05$	$p > 0.05$	$p > 0.05$	$p < 0.05$	

Table 6.3.2 : Traffic offence rate per 5,000 miles travelled.

mileage range		Boys					Girls				
		Pre	Con	Full	Sim	Total	Pre	Con	Full	Sim	Total
0- 5,000	traffic offences	4	30	16	0	50	1	3	5	1	10
	miles	414	925	832	58	2229	82	520	296	54	952
	rate	.0097	.0324	.0192	.0000	.0224	.0122	.0058	.0169	.0185	.0105
5-10,000	traffic offences	7	8	12	0	27	0	2	3	0	5
	miles	357	761	630	50	1848	59	312	129	36	536
	rate	.0004	.0105	.0190	.0000	.0146	.0000	.0064	.0233	.0000	.0093
10-15,000	traffic offences	7	9	8	2	26	0	0	1	0	1
	miles	305	636	506	45	1492	29	203	57	27	316
	rate	.0230	.0142	.0158	.0444	.0174	.0000	.0000	.0175	.0000	.0032
15-20,000	traffic offences	5	7	7	1	20	0	0	0	0	0
	miles	278	541	451	40	1310	25	137	32	16	210
	rate	.0180	.0129	.0155	.0250	.0153	.0000	.0000	.0000	.0000	.0000
20-25,000	traffic offences	10	3	2	0	15	1	0	0	0	1
	miles	244	455	325	30	1054	15	83	27	15	140
	rate	.0410	.0066	.0062	.0000	.0142	.0667	.0000	.0000	.0000	.0071
25-30,000	traffic offences	5	7	7	0	19	0	0	1	0	1
	miles	215	400	279	25	919	15	60	11	5	91
	rate	.0233	.0175	.0251	.0000	.0207	.0000	.0000	.0909	.0000	.0110
30-35,000	traffic offences	0	0	2	0	2	0	1	0	0	1
	miles	165	313	200	25	703	10	40	5	5	60
	rate	.0000	.0000	.0100	.0000	.0028	.0000	.0250	.0000	.0000	.0167
35-40,000	traffic offences	2	5	2	1	10	0	1	0	0	1
	miles	137	274	159	25	595	10	25	5	0	40
	rate	.0146	.0182	.0126	.0400	.0168	.0000	.0400	.0000	.0000	.0250
40-45,000	traffic offences	0	1	0	0	1	0	0	0	0	0
	miles	125	249	115	15	504	5	20	5	0	30
	rate	.0000	.0040	.0000	.0000	.0020	.0000	.0000	.0000	.0000	.0000
45-50,000	traffic offences	1	4	0	0	5	0	0	0	0	0
	miles	120	193	101	10	424	5	14	5	0	24
	rate	.0083	.0207	.0000	.0000	.0118	.0000	.0000	.0000	.0000	.0000
50-55,000	traffic offences	0	1	0	0	1	0	0	0	0	0
	miles	85	120	75	10	290	0	10	0	0	10
	rate	.0000	.0083	.0000	.0000	.0034	.0000	.0000	.0000	.0000	.0000
55-60,000	traffic offences	1	0	0	0	1	0	0	0	0	0
	miles	75	115	70	5	265	0	10	0	0	10
	rate	.0133	.0000	.0000	.0000	.0038	.0000	.0000	.0000	.0000	.0000

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mileage range	Boys						Girls				
	Pre	Con	Full	Sim	Total		Pre	Con	Full	Sim	Total
60-65,000 traffic offences	0	0	0	0	0		0	0	0	0	0
miles	50	80	55	5	200		0	0	0	0	0
rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000
65-70,000 traffic offences	1	0	1	0	2		0	0	0	0	0
miles	50	72	49	5	176		0	0	0	0	0
rate	.0200	.0000	.0204	.0000	.0114		.0000	.0000	.0000	.0000	.0000
70-75,000 traffic offences	0	1	2	0	3		0	0	0	0	0
miles	30	55	35	0	120		0	0	0	0	0
rate	.0000	.0182	.0571	.0000	.0250		.0000	.0000	.0000	.0000	.0000
75-80,000 traffic offences	2	1	0	0	3		0	0	0	0	0
miles	20	40	30	0	90		0	0	0	0	0
rate	.1000	.0250	.0000	.0000	.0333		.0000	.0000	.0000	.0000	.0000
80-85,000 traffic offences	0	0	0	0	0		0	0	0	0	0
miles	20	25	25	0	70		0	0	0	0	0
rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000
85-90,000 traffic offences	0	0	2	0	2		0	0	0	0	0
miles	15	25	25	0	65		0	0	0	0	0
rate	.0000	.0000	.0800	.0000	.0308		.0000	.0000	.0000	.0000	.0000
90-95,000 traffic offences	0	0	0	0	0		0	0	0	0	0
miles	15	20	25	0	60		0	0	0	0	0
rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000
95-100,000 traffic offences	0	0	1	0	1		0	0	0	0	0
miles	12	16	20	0	48		0	0	0	0	0
rate	.0000	.0000	.0500	.0000	.0208		.0000	.0000	.0000	.0000	.0000

FIGURE 6.3.2 FREQUENCY DISTRIBUTION OF FEMALE DRIVERS' TRAFFIC OFFENCES AND MILEAGE DRIVEN

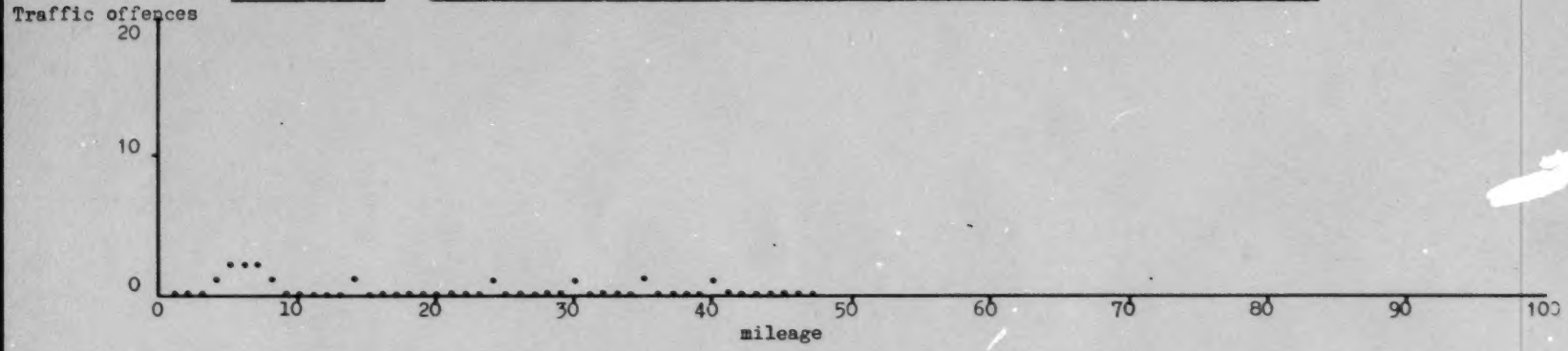


FIGURE 6.3.1 FREQUENCY DISTRIBUTION OF MALE DRIVERS' TRAFFIC OFFENCES AND MILEAGE DRIVEN

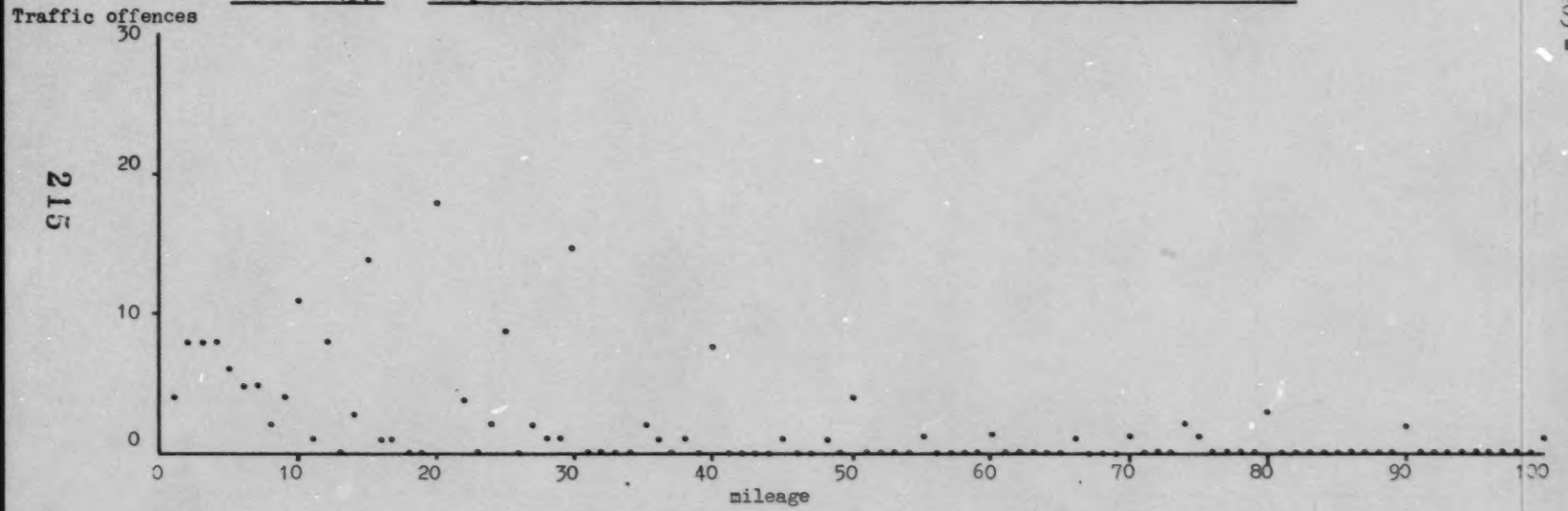


FIGURE 6.3.3 TRAFFIC OFFENCE RATE PER 5000 MILES RANGE DRIVEN (BOYS)

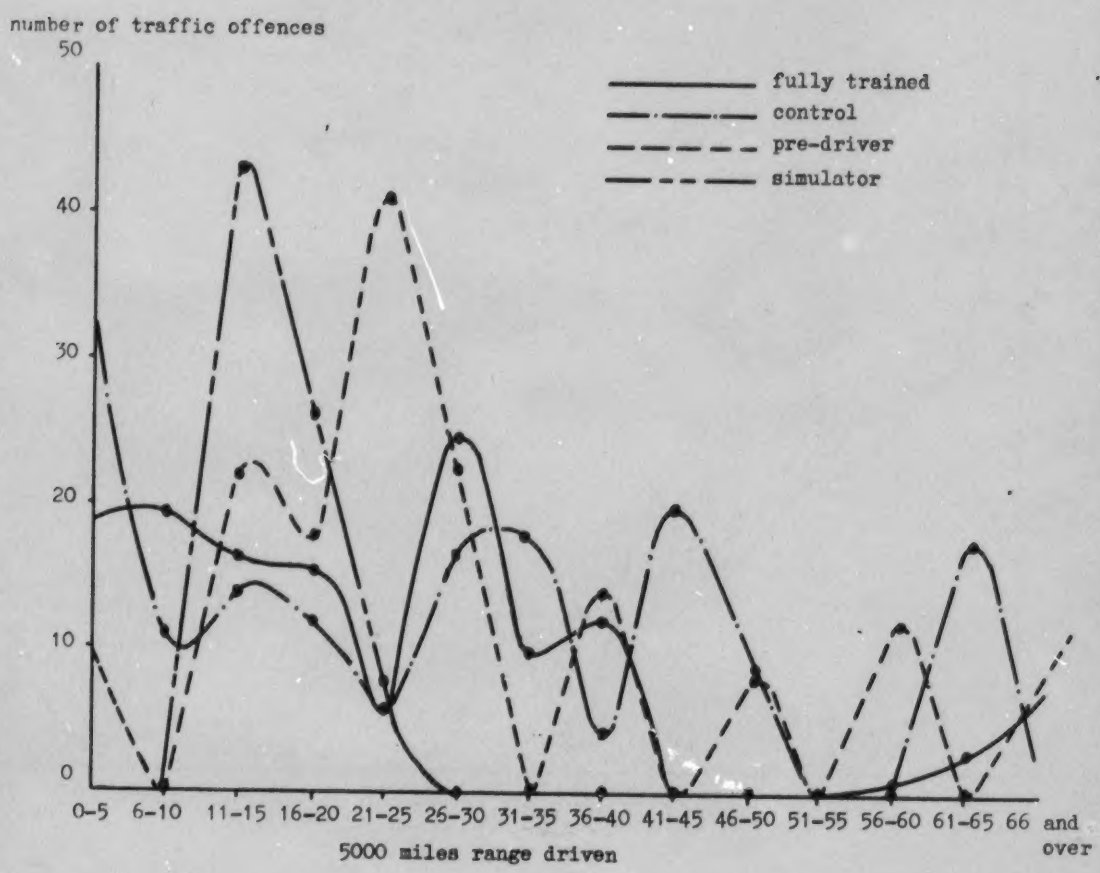


FIGURE 6.3.4 OBSERVED AND EXPECTED FREQUENCY DISTRIBUTIONS OF TRAFFIC OFFENCES PER 5000 MILE RANGE DRIVEN

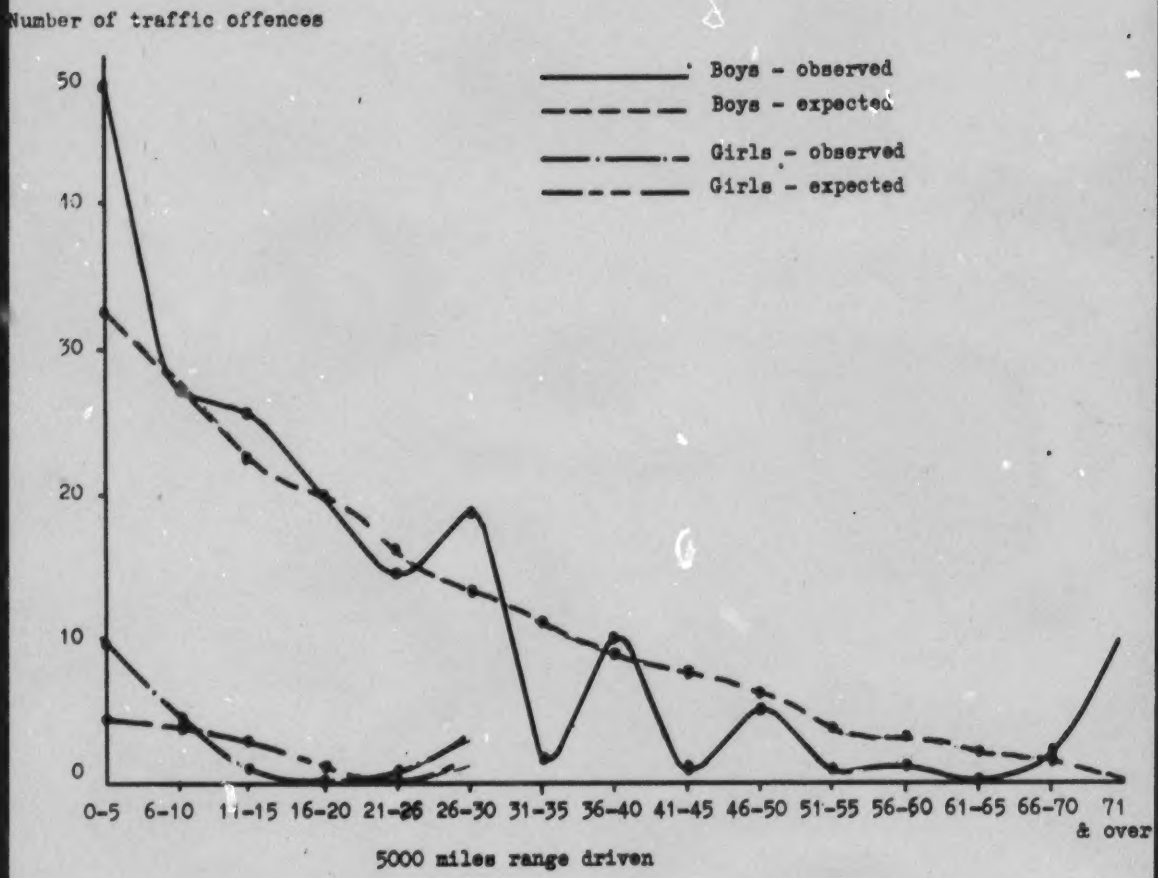


table also shows whether the boy/girl differential with respect to these traffic offence rates was significant. In all cases except that of the simulator trained groups, these differences were significant, i.e. the girls had fewer prosecutions per month of driving experience than did the boys. Figures 6.4.1 and 6.4.2 show the frequency distribution of traffic offences and driving experience for the boys and girls respectively, in graphical form.

This confirms the finding noted in the previous section - namely that the relationship between training and traffic offences noted in earlier section is not a direct causal one but rather one of asscciation with a third variable, namely experience, which is in this instance measured by the length of time they have been driving, which is associated in different quantities with the different forms of training.

As it has been shown earlier that this average rate is not an accurate predictor of accidents and that the average traffic offence rate per 1,000 miles was tending to obscure the effect of experience (as measured by mileage), it is possible that the same also applies for the relationship between the average traffic offences rate per month of driving experience and training. Table 6.4.2 shows the incident rate per 6 months of driving experience. This table shows the incident rate in any 6 month period for those who have already been driving for x months. From this table it can be seen that the likelihood of being charged with a traffic offence declined as experience increased. There were no significant differences within either the boys' or girls' sample for any level of experience. The girls' rates were in all cases, lower than the boys'. Figure 6.4.3 shows the traffic offence rates for each group of 6 months of experience for each of the four groups of boys in a graphical form. Since there were so few traffic offences reported by the girls, a similar graph has not been included for the girls.

The fact that the traffic offence rates declined so strongly with experience was contrary to what one would expect from the previously calculated average incident rate per mile which implies a constant rate. The null hypothesis of equality between incident rates was tested. The incident rates per 6 months of experience were not found to be the same for all levels of experience, in either the boys' or the girls' sample. Figure 6.4.4 shows the observed and expected prosecutions frequencies per 6 months of experience. It can be seen that the decline in the slope of the curve of the expected number of traffic offences is more gradual than is actually observed.

These findings are of interest since the previous analysis, carried out when only half of the follow up studies had been completed, showed no systematic variation between the different levels of experience and prosecutions, although the frequency of certain types of offences declined with experience. Thus, increasing the number of traffic offences has altered the relationship with experience.

Thus once again, traffic offences have been found to follow a similar pattern to accidents - namely that they decline in frequency as experience as measured by the length of time a person has been driving increases. Experience was found to play a larger part in explaining the differences between the groups within the sample than did training.

In so far as they follow the same pattern as accidents, traffic offences may be said to constitute useful criteria of accident measures. A closer examination of the nature of traffic offences and the way they decline with experience may therefore help to explain what it is that is being learned with experience. Although both accident and traffic offence rates have been shown to resemble learning curves, it has not been possible to ascertain what it is that is being learned.

Table 6.4.1 : Incident rate per month of driving experience

	Pre-driver	Control	Full	Simulator	Total	χ^2
Boys:						
Incidents	45	77	62	4	188	
Total months' experience	4111	8884	7919	584	21498	
Incident rate	0.011	0.009	0.008	0.007	0.009	$p>0.05$
Girls:						
Incidents	2	7	10	1	20	
Total months' experience	974	5816	4635	566	11991	
Incident rate	0.002	0.001	0.002	0.002	0.002	$p>0.05$
χ^2 boy/girl difference	$p<0.05$	$p<0.05$	$p<0.05$	$p>0.05$	$p<0.05$	

Table 6.4.2 : Traffic offence rate per 6 months of driving experience.

Months		Boys					Girls				
		Pre	Con	Full	Sim	Total	Pre	Con	Full	Sim	Total
0- 6	traffic offences	5	23	10	0	38	0	0	4	1	5
	months	559	1440	1267	84	3350	144	957	821	30	1952
	rate	.0089	.0160	.0079	.0000	.0113	.0000	.0000	.0049	.0330	.0026
7-12	traffic offences	11	11	11	1	34	1	3	0	0	4
	months	532	1379	1231	84	3226	130	943	785	85	1943
	rate	.0207	.0080	.0001	.0119	.0105	.0077	.0032	.0000	.0000	.0021
13-18	traffic offences	14	13	9	0	36	1	2	1	0	4
	months	508	1249	1204	82	3043	123	894	725	84	1826
	rate	.0276	.0104	.0075	.0000	.0118	.0081	.0022	.0014	.0000	.0022
19-24	traffic offences	2	4	8	1	15	0	0	0	0	0
	months	487	1149	1149	78	2863	118	812	691	83	1704
	rate	.0041	.0035	.0070	.0128	.0052	.0000	.0000	.0000	.0000	.0000
25-30	traffic offences	7	10	10	1	28	0	0	1	0	1
	months	450	1039	1113	77	2679	114	716	648	75	1553
	rate	.0156	.0096	.0090	.0130	.0105	.0000	.0000	.0015	.0000	.0006
31-36	traffic offences	3	3	6	1	13	0	0	3	0	3
	months	355	872	1006	67	2300	100	530	564	67	1261
	rate	.0085	.0034	.0060	.0149	.0057	.0000	.0000	.0053	.0000	.0024
37-42	traffic offences	1	6	8	0	15	0	0	0	0	0
	months	385	689	601	65	1740	89	384	364	43	880
	rate	.0026	.0087	.0133	.0000	.0086	.0000	.0000	.0000	.0000	.0000
43-48	traffic offences	1	3	0	0	4	0	2	1	0	3
	months	332	499	224	36	1091	72	302	143	33	550
	rate	.0030	.0060	.0000	.0000	.0037	.0000	.0066	.0070	.0000	.0055
49-54	traffic offences	2	3	0	0	5	0	0	0	0	0
	months	806	290	23	11	1130	47	182	6	6	241
	rate	.0025	.0103	.0000	.0000	.0044	.0000	.0000	.0000	.0000	.0000
55-60	traffic offences	1	1	0	0	2	0	0	0	0	0
	months	95	167	0	0	262	21	50	0	0	71
	rate	.0105	.0060	.0000	.0000	.0076	.0000	.0000	.0000	.0000	.0000
61-66	traffic offences	0	0	0	0	0	0	0	0	0	0
	months	36	58	0	0	94	19	1	0	0	20
	rate	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Months		Boys						Girls				
		Pre	Con	Full	Sim	Total		Pre	Con	Full	Sim	Total
67-72	traffic offences	0	0	0	0	0		0	0	0	0	0
	months	9	31	0	0	40		13	0	0	0	13
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000
73-78	traffic offences	0	0	0	0	0		0	0	0	0	0
	months	0	6	0	0	6		6	0	0	0	6
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000

FIGURE 6.4.1 FREQUENCY DISTRIBUTION OF TRAFFIC OFFENCES AND DRIVING EXPERIENCE (BOYS)

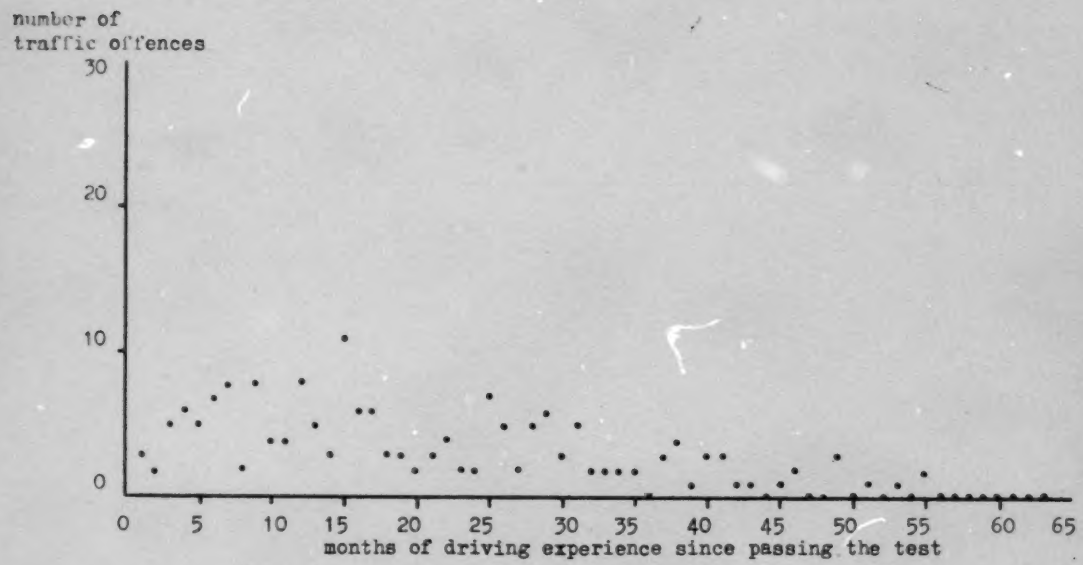


FIGURE 6.4.2 FREQUENCY DISTRIBUTION OF TRAFFIC OFFENCES AND DRIVING EXPERIENCE (GIRLS)

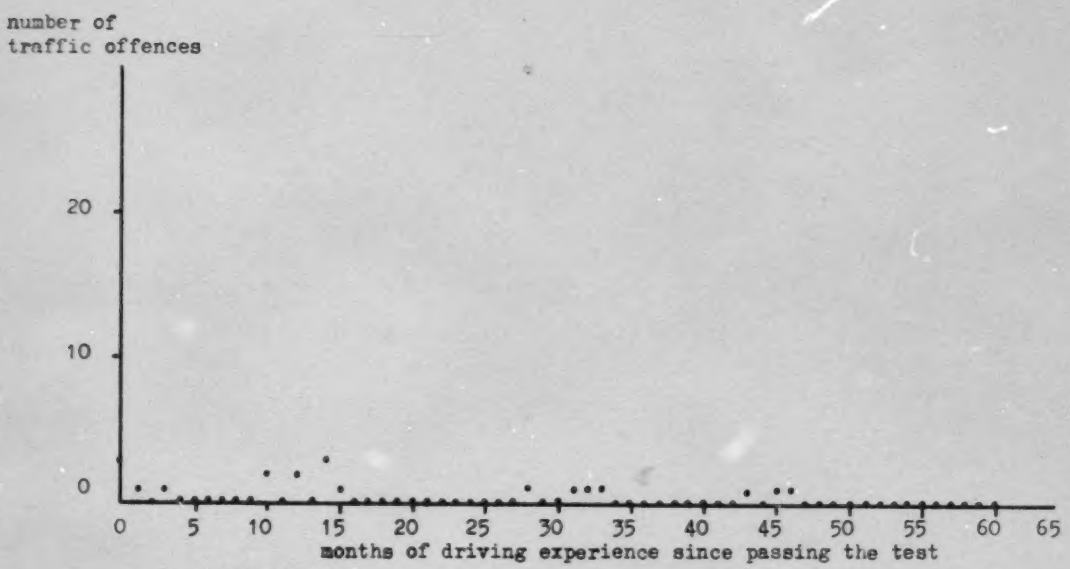


FIGURE 6.4.3 TRAFFIC OFFENCE RATE PER 6 MONTHS OF DRIVING EXPERIENCE (BOYS)

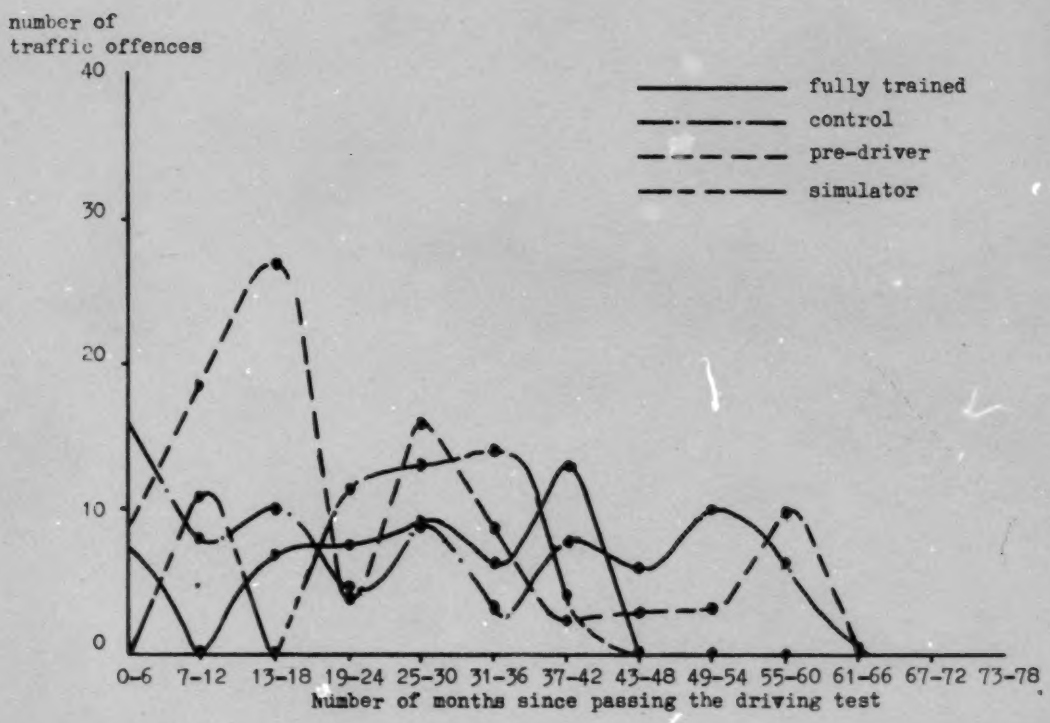
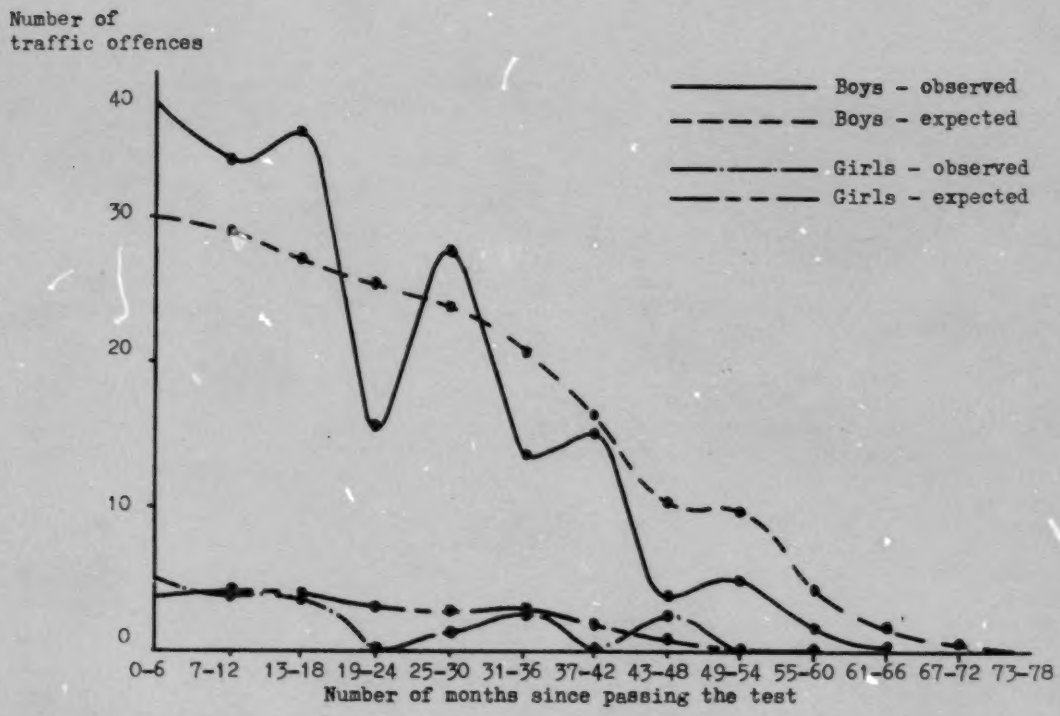


FIGURE 6.4.4 OBSERVED AND EXPECTED FREQUENCY DISTRIBUTIONS OF TRAFFIC OFFENCES PER 6 MONTHS OF DRIVING EXPERIENCE



6.5 The relationship between a course of driver education and the age when prosecutions most frequently occurred

Since age is related to accident frequency and there is an implicit assumption that traffic offences are related to unsafe driving practices and therefore to accidents, the effect of age on the number of prosecutions was considered. Figures 6.5.1 and 6.5.2 show the frequency distribution of age and traffic offences for the boys and girls respectively. It can be seen that the frequency appears to be fairly constant and that the girls have fewer traffic offences than the boys. However, the nature of the relationship between age and traffic offences is not clear. Table 6.5.1 shows the number of traffic offences per driver for each six months of driving age after the minimum licensing age. It can be seen that the likelihood of being charged with a traffic offence declined as age increased. This finding was observed for all the boys' groups and the girls' sample. There was a tendency for these rates to increase about 4-5 years after the minimum licensing age. This seems likely to be due to the small sample size. The girls' rates were lower than the boys' rates within the boys' sample, for each age range, the fully trained boys had fewer prosecutions per driver than any of the other groups. Figure 6.5.3 shows the traffic offence rates per driver per 6 months of age since the minimum licensing age for each of the boys' groups in graphical form.

The null hypothesis of equality between prosecution rates per driver for each six months of age after the 17th birthday. These rates were not found to be the same for each age group. Figures 6.5.4 shows the observed and expected frequency distribution of age and traffic offences for the boys and girls in graphical form. It can be seen that once again, traffic offences follow a similar pattern to accidents - namely that they decline in frequency as experience and age increase. In addition, this finding is of interest because the previous study, carried out when the follow up studies had not been completed, showed no systematic variation between age and prosecutions. By increasing the size of the sample of traffic offences and the heterogeneity of the age range, it has been possible to detect such a relationship. This in turn, improves the usefulness of employing traffic offences as criteria for evaluating an accident countermeasure.

However, while the statistical significance of the relationship between age and traffic offences has been ascertained, its substantive significance is less certain. Age is a summary variable with little explanatory power of its own, particularly with respect to a sample which is, from a physiological point of view, an adult one and very homogeneous. While it may be assumed that it is the different behavioural patterns associated with the different age groups which result in different prosecution rates, it is not clear which aspects of behaviour are involved, e.g. the extent of interaction with the car, driving skill as such etc., etc. Since age is known to be related to total mileage and other factors (Shaoul, 1975), it can be assumed that in part, it is measuring skill, type of exposure to risk, particularly night driving since age was associated with employment status which was also associated with the purpose of driving and that in turn was associated with day/night driving.

6.6 The relationship between age, experience and mileage and prosecutions for traffic offences

An attempt was made to isolate the effects of increasing age and experience. The two dimensional tables shown in Tables 6.6.1 and 6.6.2 have age along one axis and experience along the other and show the prosecution rates per driver within each six month period for all the boys and all the girls respectively. No traffic offence rates are shown in the upper triangle since the earliest one could have passed the test is at seventeen years of age and it is therefore impossible to have been a full licence holder for more months than the number

TABLE 6.5.1 THE TRAFFIC OFFENCE RATE PER DRIVER FOR EACH SIX MONTHS OF DRIVING AGE AFTER THE MINIMUM LICENSING AGE

		Boys					Girls				
		Pre	Con	Full	Sim	All	Pre	Con	Full	Sim	All
0-6	traffic offences	1	2	1	0	4	0	0	1	0	1
	drivers	13	25	49	5	92	0	4	16	0	24
	rate	.0769	.0800	.0204	.0000	.0435	.0000	.0000	.0625	.0000	.0417
7-12	traffic offences	4	11	7	0	22	0	0	2	1	3
	drivers	42	104	154	10	310	6	56	60	7	129
	rate	.0952	.1058	.0455	.0000	.0710	.0000	.0000	.0333	.1429	.0233
13-18	traffic offences	9	12	14	0	33	1	1	2	0	4
	drivers	61	139	177	11	388	10	94	97	11	212
	rate	.1475	.0863	.0791	.0000	.0851	.1	.0106	.0206	.0000	.0189
19-24	traffic offences	6	8	8	0	22	0	0	0	0	0
	drivers	66	162	187	13	428	11	116	105	13	245
	rate	.0909	.0494	.0428	.0000	.0514	.0000	.0000	.0000	.0000	.0000
25-30	traffic offences	4	8	7	0	19	0	0	0	0	0
	drivers	69	181	192	13	455	16	133	113	14	276
	rate	.0580	.0442	.0365	.0000	.0418	.0000	.0000	.0000	.0000	.0000
31-36	traffic offences	3	11	9	0	23	0	0	2	0	2
	drivers	75	201	200	14	490	16	143	117	14	290
	rate	.0400	.0547	.0450	.0000	.0469	.0000	.0000	.0171	.0000	.0069
37-42	traffic offences	5	11	4	3	23	0	0	2	0	2
	drivers	78	215	197	14	504	17	143	126	13	299
	rate	.0641	.0512	.0203	.2143	.0456	.0000	.0000	.0159	.0000	.0067
43-48	traffic offences	3	5	11	1	20	0	0	0	0	0
	drivers	82	198	147	14	441	21	126	109	13	269
	rate	.0366	.0253	.0748	.0714	.0454	.0000	.0000	.0000	.0000	.0000
49-54	traffic offences	5	4	0	0	9	0	3	1	0	4
	drivers	80	156	87	8	331	22	94	64	11	191
	rate	.0625	.0256	.0000	.0000	.0272	.0000	.0319	.0156	.0000	.0209
55-60	traffic offences	3	5	0	0	8	1	1	0	0	2
	drivers	78	110	23	2	213	22	78	20	5	125
	rate	.0385	.0455	.0000	.0000	.0376	.0455	.0128	.0000	.0000	.016

continued

		Boys						Girls				
		Pre	Con	Full	Sim	All		Pre	Con	Full	Sim	All
61-66	traffic offences	1	0	1	0	2		0	0	0	0	0
	drivers	50	58	2	0	110		18	42	1	0	61
	rate	.0200	.0000	.5000	.0000	.0182		.0000	.0000	.0000	.0000	.0000
67-72	traffic offences	1	0	0	0	1		0	0	0	0	0
	drivers	21	20	2	0	43		7	10	0	0	17
	rate	.0476	.0000	.0000	.0000	.0233		.0000	.0000	.0000	.0000	.0000
73-78	traffic offences	0	0	0	0	0		0	0	0	0	0
	drivers	6	10	1	0	17		4	0	0	0	4
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000
79-84	traffic offences	0	0	0	0	0		0	0	0	0	0
	drivers	1	3	0	0	4		1	0	0	0	1
	rate	.0000	.0000	.0000	.0000	.0000		.0000	.0000	.0000	.0000	.0000

FIGURE 6.5.1 FREQUENCY DISTRIBUTION OF TRAFFIC OFFENCES AND AGE WHEN THEY OCCURRED - BOYS

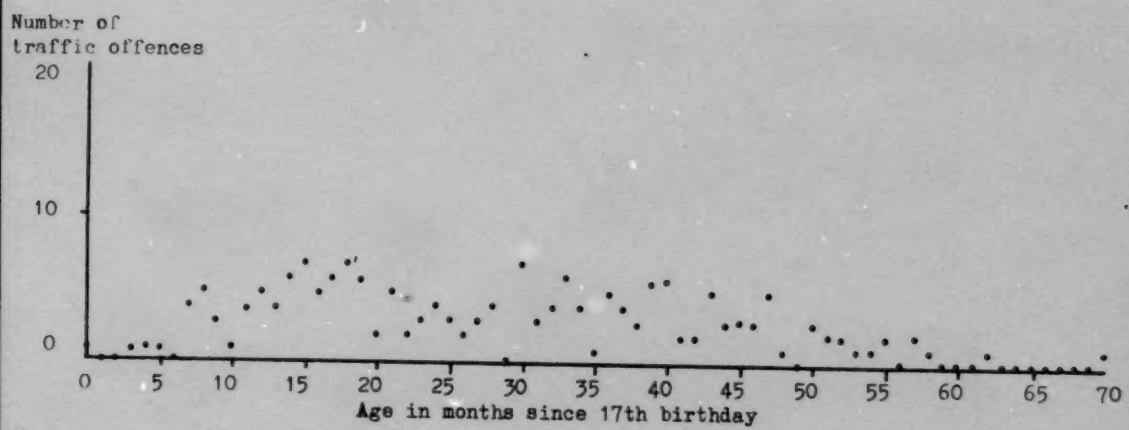


FIGURE 6.5.2 FREQUENCY DISTRIBUTIONS OF TRAFFIC OFFENCES AND AGE WHEN THEY OCCURRED - GIRLS

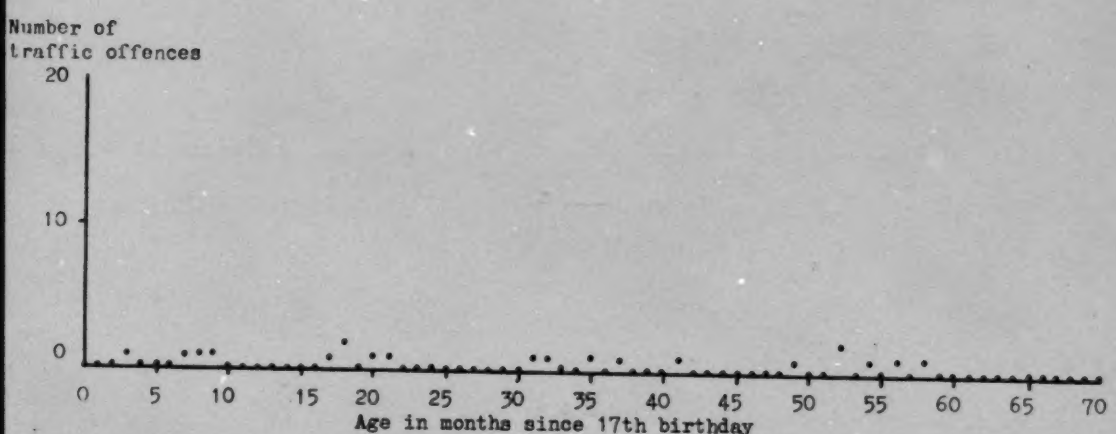


FIGURE 6.5.3 TRAFFIC OFFENCE RATE PER 6 MONTHS OF AGE (BOYS)

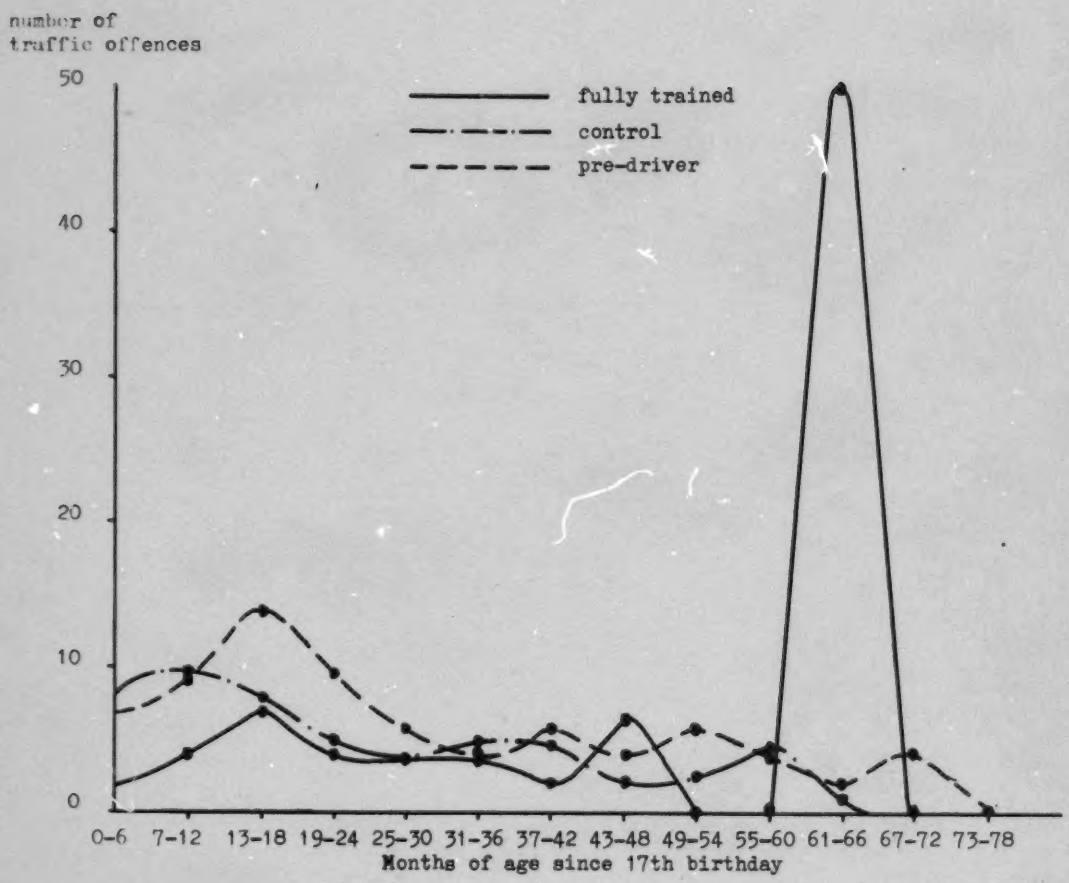
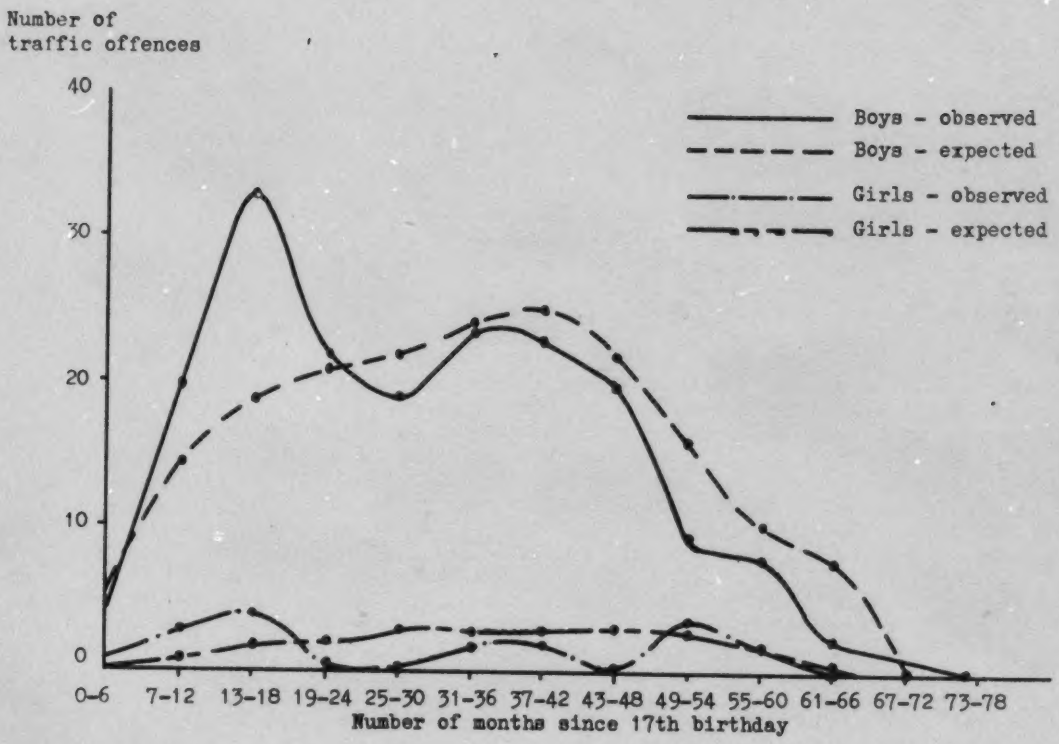


FIGURE 6.5.4 OBSERVED AND EXPECTED FREQUENCY DISTRIBUTION OF TRAFFIC OFFENCE PER DRIVER PER 6 MONTHS OF AGE AFTER 17TH BIRTHDAY



of months after the 17th birthday. Each diagonal starting from the left hand side, shows the progression of the students' traffic offence rates per driver per 6 months from the time when they passed the test, during successive six month intervals. Generally, the rates decline as age and experience increases.

Each column shows the effect of age when the level of experience is held constant. When any one column is examined, it can be seen that there is some variation between the rates, but no overall trend emerges. The highest rates for the boys in any one column are denoted by 'A' and it will be observed that the number of 'A's' is very low and very similar for the 17-19 year olds. The highest rates are more likely to be in the age range 20-22 where the sample sizes are smaller. The number of 'A's' for the girls are found to be very similar for the different age groups. Thus it would appear that age per se (as distinct from length of time they have been driving) is not an important determinant of the prosecution rate per driver. It would also appear that the age at which one learns to drive (for this group of drivers who are fairly homogeneous with respect to age) has little effect on the frequency of traffic offences.

Each row shows the effect of experience when age is kept constant. When the rows are examined, it can be seen that the rates tend to decline slightly. The highest rates in any one row are denoted by A and it will be seen that it is usually to be found within the first year and a half of learning to drive, irrespective of the age of learning to drive. It would seem that on the whole, experience (as measured by the number of months since passing the test) is associated with more consistent variation in the traffic offence rate per driver than age, for younger drivers. The data presented do not permit any firm conclusions to be drawn since the less important measure of experience has been used - namely that of time rather than distance. (The nature of the mileage data, because it does not increase at a constant rate for all drivers, does not permit a similar analysis to be carried out for age and mileage or for experience and mileage).

It is interesting that the results are broadly similar for both the boys and the girls whose accident and traffic offence involvement appeared to be very dissimilar. This would suggest that the major determinant of the variation in traffic offence involvement is experience. The girls, driving far less than the boys, had acquired far less driving experience.

Correlational analysis was carried out for all the data collected in the last survey prior to October, 1974. No significant correlations with accidents or traffic offences were observed for the boys' sample. In the girls' sample however, traffic offences occurring in the seven months prior to being contacted in 1974 were found to be significantly correlated with total mileage since passing the driving test, average weekly mileage and the number of parking offences. However, in no case was this relationship very high.

An attempt was made to assess the contribution of each of the three variables, age, experience and total mileage, to prosecutions for traffic offences. The information obtained at each survey was used, concerning each individual member of the sample. That is, several observations were made of the same sample. These observations are not of course independent since at each survey point, age, experience and mileage has increased. An analysis of the intercorrelation data showed that age was correlated very closely with experience (about 0.95 for most groups) and that experience was correlated more closely with mileage (about 0.50) than age was (about 0.40). Of the three variables, mileage was correlated more closely with the number of traffic offences. Although the multiple R was found to be significant at the 5% level for most of the groups, the percentage of variation explained (between 5% and 25%) is of little practical value. Thus while there is some relationship between age, experience, mileage and traffic offences, it is not very high. Total mileage was found to be the most important variable in predicting prosecutions. The results were broadly similar for all the groups of boys and girls.

TABLE 6.6.1 AGE, EXPERIENCE AND PROSECUTIONS FOR TRAFFIC OFFENCES AMONG ALL BOYS

Months of age after 17th birthday	Months of driving experience 0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	61-66	67-72	Total number of A's
0-6	B .04												0
7-12	B .07	B .07											0
13-18	.1	.08	B .11										0
19-24	.05	.0	B .07	.05									0
25-30	.0	.03	.04	.04	B .08								0
31-36	AB .14	.04	.0	.0	.06	A .04							2
37-42	.11	AB .14	.0	.03	.01	.03	.06						1
43-48	.0	.09	.03	.0	AB .17	.03	.05	.02					1
49-54	.0	.06	B .11	.0	.0	.0	.0	.02	A .07				1
55-60	.0	.09	AB .17	A .1	.0	.0	.05	.0	.03	.06			2
61-66	.0	.0	.2	.0	.0	.0	AB .25	.0	.0	.0	.0		1
67-72	.0	.0	.0	.0	.0	.0	.0	.0	.0	AB .1	.0	.0	1
Total number of B's	3	1	4	0	2	0	1	0	0	1	0	0	

A denotes the worst age group at each level of experience
B " experience level at each age.

TABLE 6.6.2 AGE, EXPERIENCE AND PROSECUTIONS FOR TRAFFIC OFFENCES AMONG ALL THE GIRLS

Months of age after 17th birthday	Months of driving experience: 0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	61-66	67-72	Total number of A's
0-6	A .25 B .03												1
7-12	.0	.01	AB .25 B .02										0
13-18	.01	.01	.0	.0									1
19-24	.0	.0	.0	.0	.0								0
25-30	.0	.0	.0	.0	.0 C A .01	AB .05 B .02							0
31-36	.0	.03	.0	.0	.0	.0	.0						2
37-42	.0	.0	.0	.0	.0	.0	.0	.0					0
43-48	.0	.0	.0	.0	.0	.0	.0	.0 A .04	.0				0
49-54	.0	AB .13	.0	.0	.0	.0	.0	.03	.0	.0			2
55-60	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0		0
61-66	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0
67-72	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0
Total number of B's	2	1	3	0	0	2	0	0	0	0	0	0	

A denotes the worst age group at each level of experience
B " experience level at each age.

Thus all three methods of determining the contribution made to the number of prosecutions by age, experience and mileage point to the greater importance of total mileage than age and length of driving time. This would tend to indicate that the ability to avoid being prosecuted is acquired by practice rather than by changes in life style that go with different age ranges. However it must be pointed out that this is a very homogeneous sample with respect to age, type of employment etc., and consequently the effects of these factors may be more apparent in a more heterogeneous sample. In addition, without further analysis of the type of traffic offence with which the sample were charged, it is impossible to say which aspects of driving behaviour are being modified by practice, thereby resulting in fewer prosecutions.

6.7 The effect of a course of driver education on the total number of charges

As has been stated previously, it is possible that a driver may be charged with several offences relating to the one incident, although in the event, he may only be found guilty of one of them. There are therefore more charges than there are incidents. So far, only the number of incidents have been considered.

Table 6.7.1 shows the number of charges per incident and the total number of charges for each of the boys' groups. These are very similar and do not alter the overall picture. Thus there is no reason not to use the number of incidents giving rise to one or more prosecutions for traffic offences rather than the number of traffic offences per se.

6.8 The effect of a course of driver education on the type of traffic offence

So far, the analysis of the effectiveness of driver education with regard to traffic offences has considered all the incidents which resulted in a traffic offence. The relative importance of the different types of traffic offences have not been considered. It is possible that driver education may have affected the type of offence with which a person is charged.

Table 6.8.1 presents information collected from the traffic offence description form for each of the boys' groups. Table 6.8.2 shows similar information for each of the girls' groups. The frequency distributions of all the charges, coded according to Table 6.1.1 are shown at the end of these tables. It will be seen that speeding is the most frequent offence for all the groups with the exception of the small simulator trained group. More than one third were charged with this offence. For the pre-driver trained group and fully trained group, the second most frequent offence was a breach of the construction and use regulations. This was the most frequent offence for the simulator group. The other major reason for prosecution was the failure to comply with the traffic signals or signs. The control group's most frequent charge was driving without due care and attention. The differences between the groups are not very large.

It can be seen that there is little change between these results and those obtained from an earlier analysis of the data (Shaoul, 1972). The same rank of frequency of the charges is to be observed, i.e. speeding, construction and use regulations and ignoring traffic signals. Not only is the rank order of the frequency distribution very similar, but the percentage frequency distributions are also very similar, despite the fact that the number of traffic offences has more than doubled. In addition, the tendency noted earlier for the control group to have more of the more serious driving offences is still apparent.

It can be seen from Tables 6.8.1 and 6.8.2 that there are few of the more serious traffic offences. It seems unlikely that these inexperienced young drivers did not commit any acts of bad driving. One can only assume that these were not observed by the police or reported to the police. This may support the suggestion made earlier that there may be a bias in the way the laws regarding driving are enforced. This would tend to throw some doubt on the

Table 6.7.1 : Total number of charges per incident.

	Pre-driver	Control	Full	Simulator	Total
Boys:					
Total number of charges	52	89	73	4	218
Number of charges per incident	1.16	1.16	1.18	1.00	1.16
Girls:					
Total number of charges	2	7	10	1	20
Number of charges per incident	1.00	1.00	1.00	1.00	1.00

usefulness of traffic offences as a research tool for assessing driving performance and therefore as a criterion for driver education.

Another classification of traffic offences was compiled since there was a certain amount of overlap in the previous classification, coded according to the laws (see Table 6.1.1), and was too large for our purposes. The traffic offences were subdivided into seven categories as shown in Table 6.8.3. The first category consists of non-driving technicalities and might be described as pre-driving responsibilities. The second group consists of non-driving offences where a person is aiding others to break the law. These might be described as social responsibilities. This group mainly refers to motor cycle passengers. The third group comprises of parking offences and is therefore also a non-driving offence. Only parking offences such as obstruction are included. This category does not include breach of parking meter regulations. The fourth class of offence is a driving offence and might be described as the condition of driving and includes driving whilst under the influence of drink or drugs. The fifth group consists of driving errors where errors as defined by the Highway Code have been committed. This is the group which can serve as some index of driving performance and therefore is of the most use as a criterion of driver education. The sixth group relates to stealing a vehicle and the seventh relates to the failure to stop after an accident.

Because a person might be charged with several aspects of the same law as a result of one incident (e.g. driving without 'L' plates and unaccompanied by a qualified driver), this was counted as one type of offence, rather than two, and assigned to the appropriate category. Usually, when a person received several charges arising from the one incident, they all belonged to the same general category, such as breach of the construction and use regulations. Occasionally a person was charged with two completely different types of offence, e.g. speeding and faulty brakes. Because these were two different types of offence, the one incident was assigned to two categories. There are, therefore, slightly more offences than incidents.

Table 6.8.4 shows the frequency and percentage frequency distribution of the different types of offences for each of the boys' and girls' groups. By far the most frequent type of offence is the driving error. More than two thirds belonged to this category. This therefore justifies the use of traffic offences as a criterion of driving performance. The other major category is the pre-driving responsibilities which accounts for about 16% of the offences. All the other categories were not very important. While these may be frequent offences for the public at large, they are not for a young sample such as this. When the three Salford groups of boys are compared, it can be seen that a greater percentage of the control boys' offences were driving errors than any of the Salford trained groups. When the proportion of driving errors to the rest of the offences are compared, they were found to differ significantly at the 5% level. Thus it would appear that driver trained students committed fewer driving errors, as measured by prosecutions than those who had not received such training. The differences between the proportions of the group who were charged with offences relating to pre-driving responsibilities were not sufficiently large to achieve statistical significance at the 5% level. When the frequency distributions of the types of offences for the different groups were compared, they were not found to be statistically significant. These results are broadly similar to those obtained in an earlier analysis of the data.

When the girls' traffic offences are examined, it was found that most of their offences were driving errors. The other type of offence with which they were charged was the pre-driving responsibilities. The percentage distributions were not dissimilar to those of the boys and the control girls also had a slightly higher proportion of driving errors than the trained girls. (This difference was not statistically significant, but the direction of the difference confirms the trend noted earlier).

It is difficult to draw any conclusions about the effect of driver education on the type of charge since the choice of offence appeared to be very arbitrary. Several times, the students reported that they had been speeding when they were stopped by the police but that they were charged with a breach of the construction and use regulations or provisional licence as the police felt they were unable to prove a speeding offence. It seems that the decision to charge the driver arose out of a potentially unsafe practice but that the actual charge may bear little relation to that practice. It would also appear that the police would prefer to bring a charge of driving error rather than one of pre-driving responsibilities where possible, probably because, in most people's eyes, they appear more salient to the task of safe driving. One student was interviewed by the author who said that he had been driving very slowly at night because he was trying to find the light switch in the car (it belonged to a friend) when the police stopped him for a breathalyser test. He was subsequently charged with drinking and driving, but not for driving without lights in addition to the drinking and driving charge. Another driver told the author that he had been driving very slowly because he was looking for a particular street, when the police stopped to question him. They checked the car over and charged him with having a faulty horn. Hence it can be seen that although the control boys had more of the driving error type of offence, it is with very great caution indeed that one should claim that a course in driver education reduced this type of offence.

It should be pointed out that it was in this area, namely the type of accidents, as classified by the antecedent behaviour rather than the number of accidents as a whole where differences have been observed either between trained or untrained male drivers and between boys and girls. It is interesting that it is in the type of traffic offence, i.e. as classified by the activity being carried out prior to being charged, rather than the total number, that any differences between the groups have emerged. This suggests that accidents and traffic offences are probably too broad a classification of events and covering too wide a spectrum of activities to be of very much use as criteria by which to assess and compare the levels of driving proficiency of several groups.

6.9 The relationship between age, experience and mileage and the type of traffic offence

The previous results have shown on the one hand that the likelihood of a young driver being charged with a traffic offence varies with age, experience and mileage, and on the other hand, that traffic offences cover a wide range of activities. Two major types of traffic offences were found to occur frequently, hence the possibility suggests itself that the frequency of one or both of these types of offence may vary with age, experience and mileage and variations in these will account for the differences between the groups observed in the previous section.

Table 6.9.1 shows the average rates of "pre-driving responsibility" offences per mile travelled for each of the groups. Although the control group had the best record, the differences were not significant. However, the differences between the groups with respect to the average rate of pre-driving responsibility offences per month of driving experience since passing the test was significant at the 5% level. The table also shows the average rate of "driving errors" per mile and per month of driving experience since passing the test for each of the groups. Although the fully trained group tended to have the best record and the control the worst, the differences were not statistically significant at the 5% level. Thus it would appear that to a large extent, the differences noted earlier with respect to the type of traffic offence are much more likely to be due to differences in experience than training.

Table 6.9.2 shows the rates of "pre-driving responsibility" offences per

Table 6.8.1 Boys: Traffic offence forms.

		Pre-driver		Control		Full		Simulator		Total	
Number of incidents		45	%	77	%	62	%	4	%	188	%
Occupation (From driving history questionnaire)	Student	25	56	49	64	30	48	0	0	104	55
	Earning	20	44	28	36	32	52	4	100	84	45
Additional part time or temporary job	Yes	16	36	39	51	33	53	3	75	91	48
	No	29	64	36	47	26	42	1	25	92	49
	No response	0	0	2	2	2	5	0	0	5	3
Vehicle usually drove q.4	Yes	38	84	66	86	56	90	4	100	164	87
	No	7	16	11	14	5	8	0	0	23	12
Type of vehicle	Small car	20	44	27	35	25	40	3	75	75	40
	Medium size	16	36	33	42	25	40	0	0	74	39
	Large	4	9	6	8	9	15	0	0	19	10
	Van	5	11	4	5	3	5	0	0	12	6
	Sportscar	0	0	5	6	0	0	1	25	6	3
	No response	0	0	2	3	0	0	0	0	2	0
Engine size	0-1000 cc	17	38	28	36	23	37	3	75	71	38
	1001-1500 cc	20	44	36	47	28	45	1	25	85	45
	1501-2000 cc	6	13	9	12	7	11	0	0	22	12
	2000 cc and over	1	2	2	3	2	3	0	0	5	3
	No response	1	2	2	3	2	2	0	0	4	2
Age of car	under 1 year	1	2	2	3	6	10	1	25	9	5
	between 1 and 2 years	4	9	8	10	3	5	0	0	16	9
	" 2 3 "	7	16	10	13	5	8	0	0	22	12
	" 3 4 "	4	9	10	13	1	2	0	0	15	8
	" 4 5 "	3	7	4	5	5	8	0	0	12	6
	" 5 6 "	5	11	9	12	4	6	2	50	18	10
	" 6 7 "	0	0	3	4	6	10	0	0	11	6
	" 7 8 "	1	2	6	8	6	10	0	0	13	7

		Ire-driver		Control		Full		Simulator		Total	
Age of car (Contd)	between 8 and 9 years	3	7	6	8	7	11	0	0	16	9
	" 9 10 "	5	11	4	5	4	6	0	0	13	7
	" 10 11 "	8	18	5	6	4	6	1	25	17	9
	11 years and over	3	7	9	12	10	16	0	0	23	12
	No response	1	2	1	1	1	2	0	0	3	1
Purpose of journey	Social	32	71	46	60	34	55	3	75	115	61
	Work	5	11	14	18	14	23	1	25	34	18
	To/from work/study	6	13	11	14	11	18	0	0	28	15
	Driving instruction	1	2	5	6	1	2	0	0	7	4
q.5	Other	1	2	0	1	1	2	0	0	3	2
Number of other vehicles involved in the incident q.6	One	6	12	18	23	6	10	3	75	31	16
	Two	1	2	4	5	1	2	1	25	6	3
	Three	0	0	0	0	0	0	0	0	0	0
	Four	0	0	0	0	0	0	0	0	0	0
Type of other vehicles involved	Car	7	16	18	23	6	10	1	25	31	16
	Van	0	0	1	1	1	2	0	0	2	1
	Motorcycle	0	0	2	3	0	0	0	0	3	2
	Lorry	0	0	1	1	0	0	0	0	1	1
	Bus	0	0	0	0	0	0	0	0	0	0
	No response	0	0	0	0	0	0	0	0	0	0
	Not applicable	38	84	55	71	55	89	3	75	151	80
Kind of road	Motorway	1	2	19	25	3	5	0	0	23	12
	Clearway	0	0	5	6	0	0	0	0	5	3
	Dual-carriageway	5	11	17	22	8	13	1	25	31	16
	Four lane road	4	9	22	29	9	15	0	0	35	20
	Three lane road	5	11	2	3	4	6	0	0	11	5
	Two lane road	23	51	5	6	29	47	2	50	59	31
	One way street	3	7	6	8	2	3	0	0	11	5
	No lane marking	3	7	0	0	7	11	1	25	11	5
	Don't know	0	0	0	0	0	0	0	0	0	0
	Other	1	2	1	1	0	0	0	0	2	1

		Pre-driver		Control		Full		Simulator		Total	
Policeman:	on the beat	2	4	5	6	5	8	0	0	12	6
	in a panda car	6	13	17	22	14	23	1	25	38	20
	in a patrol car	19	42	22	29	24	39	1	25	66	35
	directing traffic	0	0	2	3	0	0	0	0	2	1
	operating a radar trap	9	20	5	6	11	18	0	0	25	13
	other	3	7	6	8	3	5	1	25	13	7
	not applicable	6	13	19	25	5	8	1	25	31	16
Incident reported by:	you	3	7	7	9	2	3	0	0	12	6
	third party	0	0	7	9	1	2	0	0	8	4
	witness	1	2	1	1	1	2	0	0	3	2
	other	2	4	2	3	0	0	1	25	5	3
	don't know	0	0	0	0	0	0	0	0	0	0
	not applicable	39	87	59	77	58	94	3	75	159	85
Charged as result of accident:	Yes	5	11	18	23	8	13	1	25	32	17
	No	40	89	58	75	54	87	3	75	155	82
Within 15 miles of home:	Yes	35	78	58	75	52	84	3	75	148	79
	No	9	20	18	23	10	16	1	25	37	20
Did you know the road:	very well	12	27	21	21	26	42	2	50	61	32
	quite well	3	7	13	17	10	16	1	25	27	14
	not at all	3	7	8	10	5	8	1	25	17	9
	no response	27	60	35	45	21	34	0	0	83	44
Speed limit	30 mph	40	89	63	84	54	85	4	100	160	85
	40 mph	1	2	3	4	4	6	0	0	8	4
	50 mph	1	2	1	1	0	0	0	0	2	1
	60 mph	0	0	3	4	0	0	0	0	3	2
	70 mph	1	2	5	6	4	6	0	0	10	5
	Don't know	0	0	1	1	0	0	0	0	1	1
	Other	1	2	0	0	1	2	0	0	2	1

		Pre-driver		Control		Full		Simulator		Total	
Light conditions	Dawn	0	0	0	0	0	0	0	0	0	0
	Daylight	22	49	42	55	26	42	4	100	94	50
	Dusk	2	4	3	4	3	5	0	0	8	4
	Dark (unlit)	2	4	2	3	5	8	0	0	9	5
	Dark (lit)	18	40	29	38	28	45	0	0	75	40
Weather conditions	Clear	38	84	59	77	51	82	4	100	152	85
	Rain	5	11	15	19	8	13	0	0	28	15
	Snow	0	0	0	0	0	0	0	0	0	0
	Fog	0	0	1	1	0	0	0	0	1	1
	Severe winds	2	4	1	1	2	3	0	0	3	2
Road conditions	Dry	35	78	55	71	51	82	4	100	145	77
	Greasy	0	0	2	3	1	2	0	0	3	2
	Wet	7	16	19	25	9	15	0	0	35	19
	Muddy	0	0	0	0	0	0	0	0	0	0
	Icy	3	7	1	1	1	2	0	0	0	0
Road surface	Smooth	34	76	65	84	59	95	3	75	161	86
	Potholed	1	2	3	4	0	0	0	0	4	2
	Loose chippings	1	2	1	1	2	3	0	0	4	2
	Cobbled	2	4	1	1	0	0	1	25	4	2
	No response	7	16	7	9	1	2	0	0	15	8
Pedestrian	None	42	93	70	91	60	97	4	100	176	94
	Crossing the road at a pedestrian crossing	0	0	1	1	1	2	0	0	2	1
	Crossing the road within 20 yds of a pedestrian crossing	0	0	0	0	1	2	0	0	1	1
	Crossing elsewhere	0	0	1	1	0	0	0	0	1	1
	On the pavement	0	0	1	1	0	0	0	0	1	1
	On the central strip	0	0	0	0	0	0	0	0	0	0
	Boarding or alighting a bus	1	2	0	0	0	0	0	0	1	1
	On the road not crossing	0	0	0	0	0	0	0	0	0	0
	No response	2	4	4	5	0	0	0	0	6	3

			Pre-driver		Control		Full		Simulator		Total	
Were you found guilty?	1st offence:	Yes	39	87	60	78	52	82	3	75	153	81
		No	0	0	1	1	1	2	0	0	2	1
		Not heard	6	13	15	19	9	15	1	25	31	16
	2nd offence:	Yes	4	9	5	6	7	11	0	0	16	9
		No	1	2	1	1	1	2	0	0	3	2
		Not heard	1	0	2	3	0	0	0	0	3	2
	3rd offence:	Yes	2	4	1	1	1	2	0	0	4	2
		No	0	0	0	0	0	0	0	0	0	0
		Not heard	0	0	1	1	0	0	0	0	1	1
	4th offence:	Yes	0	0	0	0	1	2	0	0	1	1
		No	0	0	0	0	0	0	0	0	0	0
		Not heard	0	0	1	1	0	0	0	0	1	1
Penalty:	1st offence:	None	0	0	1	1	1	2	2	50	2	1
		Fine	7	16	9	12	15	24	0	0	33	18
		Endorsement	0	0	0	0	0	0	1	25	0	0
		Fine and endorsement	31	69	47	61	34	55	0	0	113	60
		Disqualified	1	2	3	4	3	5	0	0	7	4
		Not heard	6	13	15	19	9	15	1	25	31	17
	2nd offence:	None	1	2	1	1	1	2	0	0	3	2
		Fine	4	9	2	3	2	3	0	0	8	4
		Endorsement	0	0	0	0	2	3	0	0	2	1
		Fine and endorsement	0	0	1	1	3	5	0	0	4	2
		Disqualified	0	0	0	0	0	0	0	0	0	0
		Not heard	1	2	2	3	0	0	0	0	3	2
	3rd offence:	None	0	0	0	0	0	0	0	0	0	0
		Fine	2	4	1	1	1	2	0	0	4	2
		Endorsement	0	0	0	0	0	0	0	0	0	0
		Fine and endorsement	0	0	0	0	0	0	0	0	0	0
		Disqualified	0	0	0	0	0	0	0	0	0	0
		Not heard	0	0	1	1	0	0	0	0	0	0

			Pre-driver		Control		Full		Simulator		Total	
Penalty (contd). .	4th offence:	none	0	0	0	0	0	0	0	0	0	0
		fine	0	0	0	0	1	2	0	0	1	1
		endorsement	0	0	0	0	0	0	0	0	0	0
		fine and endorsement	0	0	0	0	0	0	0	0	0	0
		disqualified	0	0	0	0	0	0	0	0	0	0
		not heard	0	0	1	1	0	0	0	0	0	0
Type of offence	1. pre-driving regulations		10	22	7	9	13	21	1	25	31	16
	2. non-driving offences		0	0	0	0	2	3	0	0	2	1
	3. parking offences		3	7	1	1	1	2	1	25	6	3
	4. condition of driving		2	4	2	3	2	3	0	0	6	3
	5. driving errors		30	67	65	84	44	71	2	50	141	75
	6. stealing a vehicle		0	0	1	1	0	0	0	0	1	1
	7. failure to stop after an accident		0	0	1	1	0	0	0	0	1	1
Traffic offence charge	01		0	0	2	3	0	0	0	0	2	1
	02		6	13	16	21	5	8	1	25	28	15
	03		20	44	25	32	27	44	0	0	72	38
	04		0	0	0	0	0	0	0	0	0	0
	05		1	2	0	0	0	0	0	0	1	1
	06		0	0	0	0	0	0	0	0	0	0
	07		2	4	13	17	8	13	1	25	24	13
	08		2	4	1	1	1	2	1	25	5	3
	09		0	0	0	0	2	3	0	0	2	1
	10		2	4	2	3	0	0	0	0	4	2
	11		0	0	0	0	0	0	0	0	0	0
	12		0	0	3	4	2	3	0	0	5	3
	13		8	18	3	4	10	16	1	25	22	12
	14		0	0	1	1	1	2	0	0	2	1
	15		0	0	2	3	0	0	0	0	2	1
	16		0	0	2	3	1	2	0	0	3	2
	17		1	2	3	4	1	2	0	0	5	3
	18		0	0	1	1	0	0	0	0	1	1
	19		0	0	0	0	0	0	0	0	0	0
	20		0	0	0	0	0	0	0	0	0	0
	21		0	0	0	0	0	0	0	0	0	0
	22		0	0	0	0	0	0	0	0	0	0

		Pre-driver		Control		Full		Simulator		Total	
Traffic offence charge (contd)...	23	0	0	0	0	0	0	0	0	0	0
	24	1	2	1	1	2	3	0	0	4	2
	25	0	0	0	0	0	0	0	0	1	1
	26	0	0	0	0	0	0	0	0	1	1
	27	2	4	0	0	2	3	0	0	0	0
	28	0	0	1	1	0	0	0	0	0	0
	29	0	0	1	1	0	0	0	0	0	0
2nd Traffic offence charge	01	1	2	1	1	0	0	0	0	2	1
	02	0	0	1	1	0	0	0	0	1	1
	03	0	0	0	0	0	0	0	0	0	0
	04	0	0	0	0	0	0	0	0	0	0
	05	0	0	0	0	0	0	0	0	0	0
	06	0	0	0	0	0	0	0	0	0	0
	07	1	2	1	1	1	2	0	0	3	2
	08	0	0	0	0	0	0	0	0	0	0
	09	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0
	13	1	2	1	1	6	10	0	0	8	4
	14	1	2	1	1	0	0	0	0	2	1
	15	0	0	0	0	0	0	0	0	0	0
	16	0	0	1	1	1	2	0	0	2	1
	17	0	0	1	1	0	0	0	0	1	1
	18	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0
	27	2	4	1	1	0	0	0	0	3	2
	28	0	0	0	0	0	0	0	0	0	0
	29	0	0	0	0	0	0	0	0	0	0

		Pre-driver		Control		Full		Simulator		Total	
3rd traffic offence charge	01	0	0	0	0	0	0	0	0	0	0
	02	0	0	0	0	0	0	0	0	0	0
	03	0	0	0	0	0	0	0	0	0	0
	04	0	0	0	0	0	0	0	0	0	0
	05	0	0	0	0	0	0	0	0	0	0
	06	0	0	0	0	0	0	0	0	0	0
	07	0	0	0	0	0	0	0	0	0	0
	08	0	0	0	0	0	0	0	0	0	0
	09	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0
	13	1	17	2	6	1	5	0	0	6	10
	14	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	1	5	0	0	1	2
	16	0	0	1	3	1	5	0	0	2	3
	17	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0
	27	0	0	1	3	0	0	0	0	1	2
	28	0	0	0	0	0	0	0	0	0	0
	29	0	0	0	0	0	0	0	0	0	0
	30	0	0	0	0	0	0	0	0	0	0

Table 6.8.2 Girls: Traffic offence forms.

		Pre-driver		Control		Full		Total	
Number of incidents		2	%	7	%	10	%	20	%
Occupation (From driving history questionnaire)	Student	1	50	4	57	4	40	10	50
	Earning	1	50	3	43	6	60	10	50
Additional part time or temporary job	Yes	1	50	6	84	5	50	13	65
	No	1	50	1	14	5	50	7	35
	No response	0	0	0	0	0	0	0	0
Vehicle usually drove q.4	Yes	2	100	6	84	9	90	18	90
	No	0	0	1	14	1	10	2	10
Type of vehicle	Small car	1	50	1	14	6	60	9	45
	Medium size	1	50	3	43	3	30	7	35
	Large	0	0	0	0	0	0	2	10
	Van	0	0	2	29	0	0	0	0
	Sportscar	0	0	1	14	0	0	1	5
	No response	0	0	0	0	1	10	1	5
Engine size	0-1000 cc	0	0	1	14	5	50	6	30
	1001-1500 cc	2	100	3	43	4	40	10	50
	1501-2000 cc	0	0	3	43	0	0	3	15
	2000 cc and over	0	0	0	0	0	0	0	0
	No response	0	0	0	0	1	10	1	5
Age of car	under 1 year	1	50	1	14	0	0	1	5
	between 1 and 2 years	0	0	1	14	1	10	2	10
	" 2 3 "	1	50	3	43	1	10	4	20
	" 3 4 "	0	0	0	0	3	30	6	30
	" 4 5 "	0	0	1	14	0	0	0	0
	" 5 6 "	0	0	0	0	1	10	2	10
	" 6 7 "	0	0	1	14	0	0	0	0
	" 7 8 "	0	0	0	0	0	0	1	5
	" 8 9 "	0	0	0	0	1	10	1	5
	" 9 10 "	0	0	0	0	0	0	0	0

		Pre-driver		Control		Full		Total	
Age of car (contd)..	between 10 and 11 years	0	0	0	0	1	10	1	5
	11 years and over	0	0	0	0	1	10	1	5
	No response	0	0	0	0	1	10	1	5
Purpose of journey	Social	0	0	3	43	5	50	9	45
	Work	1	50	3	43	2	20	6	30
	To/from work/study	1	50	1	14	0	0	2	10
	Driving instruction	0	0	0	0	3	30	3	15
q.5	Other	0	0	0	0	0	0	0	0
Number of other vehicles involved in the accident	One	1	50	2	29	6	60	5	25
	Two	0	0	0	0	2	20	1	5
	Three	0	0	0	0	1	10	0	0
q.6	Four	0	0	0	0	0	0	0	0
Type of other vehicles involved	Car	1	50	0	0	6	60	1	5
	Van	0	0	0	0	0	0	1	5
	Motorcycle	0	0	2	29	1	10	3	15
	Lorry	0	0	0	0	1	10	2	10
	Bus	0	0	0	0	2	20	0	0
	No response	0	0	0	0	0	0	0	0
	Not applicable	1	50	5	71	0	0	13	65
Kind of road	Motorway	0	0	0	0	1	10	1	5
	Clearway	0	0	0	0	0	0	1	5
	Dual-carriageway	0	0	1	14	2	20	3	15
	Four lane road	0	0	1	14	3	30	4	20
	Three lane road	1	50	0	0	0	0	1	5
	Two lane road	0	0	3	43	4	40	7	35
	One way street	0	0	1	14	0	0	1	5
	No lane marking	1	50	0	0	0	0	2	10
	Don't know	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
Policeman:	On the beat	0	0	0	0	1	10	1	5
	In a panda car	1	50	2	29	1	10	4	20
	In a patrol car	0	0	1	14	2	20	3	15
	Directing traffic	0	0	0	0	0	0	0	0
	Operating a radar trap	0	0	2	29	2	20	4	20
	Other	1	50	0	0	3	30	5	25
	Not applicable	0	0	2	29	1	10	6	30

		Pre-driver		Control		Full		Total	
Incident reported by:	You	0	0	1	14	0	0	1	5
	Third party	0	0	0	0	0	0	0	0
	Witness	0	0	0	0	1	10	1	5
	Other	0	0	1	14	0	0	1	5
	Don't know	0	0	0	0	0	0	0	0
	Not applicable	2	100	5	71	9	90	17	85
Charged as a result of accident:	Yes	1	50	2	29	4	40	7	35
	No	1	50	5	71	6	60	13	65
Within 15 miles of home:	Yes	2	100	7	100	9	91	18	90
	No	0	0	0	0	1	10	2	10
Did you know the road?	Very well	1	50	4	57	3	30	8	40
	Quite well	0	0	1	14	2	20	3	15
	Not at all	0	0	2	29	1	10	3	15
	No response	1	50	0	0	4	40	6	30
Speed limit	30 mph	2	100	6	84	6	60	14	60
	40 mph	0	0	1	14	1	10	2	10
	50 mph	0	0	0	0	1	10	1	5
	60 mph	0	0	0	0	1	10	1	5
	70 mph	0	0	0	0	0	0	1	5
	Don't know	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
Light conditions	Dawn	0	0	0	0	0	0	0	0
	Daylight	2	100	5	71	5	50	13	65
	Dusk	0	0	0	0	1	10	1	5
	Dark (unlit)	0	0	0	0	2	20	2	10
	Dark (lit)	0	0	2	29	2	20	4	20
Weather conditions:	Clear	2	100	7	100	8	80	18	90
	Rain	0	0	0	0	2	20	2	10
	Snow	0	0	0	0	0	0	0	0
	Fog	0	0	0	0	0	0	0	0
	Severe winds	0	0	0	0	0	0	0	0

		Pre-driver		Control		Full		Total	
Road conditions:	Dry	2	100	6	84	7	70	16	80
	Greasy	0	0	0	0	0	0	0	0
	Wet	0	0	1	14	3	30	4	20
	Muddy	0	0	0	0	0	0	0	0
	Icy	0	0	0	0	0	0	0	0
Road surface	Smooth	2	100	7	100	9	90	19	95
	Potholed	0	0	0	0	0	0	0	0
	Loose chippings	0	0	0	0	0	0	0	0
	Cobbled	0	0	0	0	0	0	0	0
	No response	0	0	0	0	1	10	1	5
Pedestrian	None	2	100	7	100	10	100	20	100
	Crossing the road at a pedestrian crossing	0	0	0	0	0	0	0	0
	Crossing the road within 20 yds of a pedestrian crossing	0	0	0	0	0	0	0	0
	Crossing elsewhere	0	0	0	0	0	0	0	0
	On the pavement	0	0	0	0	0	0	0	0
	On the central strip	0	0	0	0	0	0	0	0
	Boarding or alighting a bus	0	0	0	0	0	0	0	0
	On the road not crossing	0	0	0	0	0	0	0	0
Were you found guilty?	1st offence: Yes	2	100	7	100	7	70	17	85
	No	0	0	0	0	0	0	0	0
	Not heard	0	0	0	0	3	30	3	15
	2nd offence: Yes	0	0	0	0	2	20	2	10
	No	0	0	0	0	0	0	0	0
	Not heard	0	0	0	0	0	0	0	0
	3rd offence: Yes	0	0	0	0	1	10	1	5
	No	0	0	0	0	0	0	0	0
	Not heard	0	0	0	0	0	0	0	0
	4th offence: Yes	0	0	0	0	0	0	0	0
	No	0	0	0	0	0	0	0	0

			Pre-driver		Control		Full		Total	
Penalty:	1st offence:	None	0	0	0	0	0	0	0	0
		Fine	0	0	1	14	1	10	2	10
		Endorsement	0	0	0	0	0	0	0	0
		Fine and endorsement	2	100	6	84	6	60	15	75
		Disqualified	0	0	0	0	0	0	0	0
		Not heard	0	0	0	0	3	30	3	15
	2nd offence:	None	0	0	0	0	0	0	0	0
		Fine	0	0	0	0	0	0	0	0
		Endorsement	0	0	0	0	0	0	0	0
		Fine and endorsement	0	0	0	0	0	0	0	0
		Disqualified	0	0	0	0	0	0	0	0
		Not heard	0	0	0	0	0	0	0	0
	3rd offence:	None	0	0	0	0	0	0	0	0
		Fine	0	0	0	0	0	0	0	0
		Endorsement	0	0	0	0	0	0	0	0
		Fine and endorsement	0	0	0	0	0	0	0	0
		Disqualified	0	0	0	0	0	0	0	0
		Not heard	0	0	0	0	0	0	20	100
	4th offence:	None	0	0	0	0	0	0	0	0
		Fine	0	0	0	0	0	0	0	0
		Endorsement	0	0	0	0	0	0	0	0
		Fine and endorsement	0	0	0	0	0	0	0	0
		Disqualified	0	0	0	0	0	0	0	0
		Not heard	0	0	0	0	0	0	20	100
Type of offence	1. Pre-driving regulations		0	0	1	14	2	20	3	15
	2. Non-driving offences		0	0	0	0	0	0	0	0
	3. Parking offences		1	50	0	0	0	0	1	5
	4. Condition of driving		0	0	0	0	0	0	0	0
	5. Driving errors		1	50	6	84	8	80	16	80
	6. Stealing a vehicle		0	0	0	0	0	0	0	0
	7. Failure to stop		0	0	0	0	0	0	0	0

		Pre-driver		Control		Full		Total	
Traffic offence charge	01	0	0	0	0	0	0	0	0
	02	1	50	2	29	4	40	7	35
	03	0	0	4	43	4	40	8	45
	04	0	0	0	0	0	0	0	0
	05	0	0	0	0	0	0	0	0
	06	0	0	0	0	0	0	0	0
	07	0	0	0	0	1	10	1	5
	08	0	0	0	0	0	0	0	0
	09	0	0	0	0	0	0	0	0
	10	1	50	1	14	0	0	2	10
	11	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0
	13	0	0	1	14	0	0	1	5
	14	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0
	27	0	0	0	0	1	10	1	5
	28	0	0	0	0	0	0	0	0
	29	0	0	0	0	0	0	0	0
	30	0	0	0	0	0	0	0	0

Car T.O. time of day frequency:

	Pre B		Con B		Ex B		Sim B		Pre G		Con G		Ex G		Sim G		Total B		Total G	
00	0	0%	2	3%	0	0%	0	0%	0	0%	0	0%	1	10%	0	0%	2	1%	1	5%
01	1	2%	6	8%	5	8%	0	0%	0	0%	1	14%	2	20%	0	0%	12	6%	3	15%
02	5	11%	0	0%	5	8%	0	0%	0	0%	0	0%	0	0%	0	0%	10	5%	0	0%
03	0	0%	1	1%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	1%	0	0%
04	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
05	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
06	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
07	0	0%	1	1%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	1%	0	0%
08	0	0%	2	3%	1	3%	0	0%	0	0%	0	0%	0	0%	0	0%	3	2%	0	0%
09	1	2%	7	9%	1	2%	0	0%	0	0%	3	43%	0	0%	0	0%	9	5%	3	15%
10	5	11%	3	4%	4	6%	0	0%	0	0%	0	0%	0	0%	0	0%	12	6%	0	0%
11	1	2%	2	3%	0	0%	0	0%	0	0%	1	14%	0	0%	1	100%	3	2%	2	10%
12	7	16%	5	6%	3	5%	1	25%	1	50%	0	0%	2	20%	0	0%	16	9%	3	15%
13	1	2%	2	3%	6	10%	0	0%	0	0%	0	0%	0	0%	0	0%	9	5%	0	0%
14	2	4%	5	6%	3	5%	1	25%	0	0%	1	14%	2	20%	0	0%	11	6%	3	15%
15	2	4%	4	5%	0	0%	1	25%	0	0%	0	0%	0	0%	0	0%	7	4%	0	0%
16	2	4%	6	8%	2	3%	0	0%	1	50%	0	0%	0	0%	0	0%	10	5%	1	5%
17	2	4%	2	3%	5	8%	1	25%	0	0%	0	0%	0	0%	0	0%	10	5%	0	0%
18	2	4%	3	4%	3	5%	0	0%	0	0%	0	0%	1	10%	0	0%	8	4%	1	5%
19	1	2%	3	4%	3	5%	0	0%	0	0%	0	0%	1	10%	0	0%	7	4%	1	5%
20	3	7%	2	3%	3	5%	0	0%	0	0%	0	0%	0	0%	0	0%	8	4%	0	0%
21	1	2%	5	6%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	6	3%	0	0%
22	4	9%	4	5%	3	5%	0	0%	0	0%	0	0%	0	0%	0	0%	11	6%	0	0%
23	3	7%	7	9%	11	18%	0	0%	0	0%	0	0%	1	10%	0	0%	21	11%	1	5%
24	1	2%	3	4%	3	5%	0	0%	0	0%	1	14%	0	0%	0	0%	7	4%	1	5%

TABLE 6.8.3 TRAFFIC OFFENCE CLASSIFICATION

Number	Type of Offence
1	Provisional licence regulations, road licence, MOT certificate, construction and use regulations, insurance, driving under age, defective eyesight, no lights on.
2	Non-driving offences - such as aiding and abetting a non-qualified rider of a motorcycle to carry unqualified passengers.
3	Parking offences.
4	Condition of driving - drink, drugs.
5	Driving errors.
6	Stealing a vehicle, taking and driving away.
7	Failure to stop after an accident.

TABLE 6.8.4 FREQUENCY DISTRIBUTION OF THE DIFFERENT TYPES OF OFFENCES

Type of offence	Pre-driver		Control		Fully trained		Simulator		Total		p
Boys											
1. Predriving regulations	11	22%	7	9%	13	21%	1	25%	32	16%	p > 0.05
2. non-driving offences	0	0%	0	0%	2	3%	0	0%	2	1%	
3. parking offences	3	7%	1	1%	1	2%	1	25%	6	3%	
4. condition of driving	2	4%	2	3%	2	3%	0	0%	6	3%	
5. driving errors	30	67%	65	84%	44	71%	2	50%	141	75%	p < 0.05
6. stealing a vehicle	0	0%	1	1%	0	0%	0	0%	1	1%	
7. failing to stop after an accident	0	0%	1	1%	0	0%	0	0%	1	1%	
Girls											
1. predriving regulations	0	0%	1	14%	2	20%			3	15%	
2. non-driving offences	0	0%	0	0%	0	0%			0	0%	
3. parking offences	1	50%	0	0%	0	0%			1	5%	
4. condition of driving	0	0%	0	0%	0	0%			0	0%	
5. driving errors	1	50%	6	84%	8	80%			16	80%	
6. stealing a vehicle	0	0%	0	0%	0	0%			0	0%	
7. failing to stop after an accident	0	0%	0	0%	0	0%			0	0%	

5,000 miles travelled for each of the boys' groups. Similar information is presented in graphical form in Figure 6.9.1. The variation between each of the 5,000 miles rates appears to be random and was not found to be statistically significant. While there is some variation in the rates at any one level of experience, this is not very large nor is it consistently in favour of any one group.

Table 6.9.3 shows the rates of "pre-driving responsibility" offences per 6 months of driving experience since passing the test. This information is presented in graphical form in Figure 6.9.2. The likelihood of being charged with this type of offence declined as experience (time) increased. These rates were significantly different from the average rate noted in Table 6.9.1. This fact may therefore cast some doubt on the interpretation that can be made of that table. A closer comparison of the rates at different levels of experience shows that the pre-driver trained boys had a consistently worse record with respect to the number of "pre-driving responsibility" offences per 6 months of experience. Thus this second set of findings clarifies the previous finding. Not only do these kinds of offences decline as experience increases, but at each level the pre-driver trained group have the worst record.

Table 6.9.4 shows the traffic offence rates (type 1) per driver per 6 months of age since the minimum licensing age for each of the groups. Figure 6.9.3 shows the same information in graphical form. It can be seen that these rates decline as age increases. These rates were found to differ significantly from each other. Again therefore there is a systematic variation between driving (as measured by the type 1 offences) and age. This suggests, as one would expect, that traffic offences of this type are related to age and the patterns of behaviour associated with youthfulness and inexperience (as defined by length of time they have been driving). Perhaps also, some of them by definition may only be committed by young and new drivers, e.g. provisional licence regulations. There is some variation between the groups, with the control boys committing fewer of these kinds of offences than either of the fully trained, but particularly the pre-driver trained drivers.

It is interesting that this analysis, carried out several years after the previous analysis, when more data have been collected, should produce very similar results, i.e. type 1 offences did not alter with increased mileage but with the length of time they had been driving and their age. Thus, while the data presented suggest that some learning has taken place, it is not possible to say what has been learned or how, other than in general terms, that certain tasks not central to the activity of driving as such, but nevertheless related to safety, e.g. the construction and use regulations, have been learned. Given that these were areas covered in the course which a learner driver does not normally encounter during instruction with either a friend or relative or a commercial instructor, it seems surprising that the control students had fewer of these kinds of errors than the trained students.

The fifth category of traffic offences - driving errors - was subjected to the same kind of analysis. The results are shown in Tables 6.9.5, 6.9.6 and 6.9.7 and in Figures 6.9.4, 6.9.5 and 6.9.6 for mileage, length of time they had been driving, and age. No observable association between mileage and length of time they had been driving was discernable. There was some variation between the boys' groups which tended to favour the driver trained students. However, traffic offences (type 5) were found to vary systematically with age - that is they declined as age increased. Again, although it is possible to discern such a trend, it is difficult to know what it is that is being learned or how. Since these offences were not found to vary systematically with mileage or experience, the average rates per mile and per month of driving experience may be said to adequately represent the occurrence of driving errors and can therefore be used as criteria for assessing driver education. These rates, while tending

to favour the driver trained students showed that there were no substantial differences between the groups.

Since these traffic offences are a measure of driving proficiency, which as measured by accidents, was found to improve with experience, incidents giving rise to traffic offences may not be random occurrences of unsafe behaviour since in that case they would follow the same pattern as accidents. This suggests that there are some limitations in extending the use of traffic offences, from their primary purpose as administrative devices, to a research tool for measuring driving proficiency.

Since the "driving error" offences were not found to be associated with mileage or length of driving career, the differences between the boys' groups with regard to the proportion of traffic offences of this type cannot be explained by differences in the groups' total mileage driven and the length of time they had been driving.

Since, however, the "pre-driving responsibility" offences were related to age and inexperience and the trained group were on the whole slightly younger and less experienced, they were more likely to commit these kinds of offences. Therefore it would appear that driver education affects the type of offence with which a person is likely to be charged because such a course encourages them to learn to drive earlier than they would otherwise have done.

It will be recalled that it was in the type of accident situation rather than the total number of accidents per mile where any differences were found to obtain between the groups. In this instance, certain types of traffic offences were found to vary with age, thereby making it very difficult to assess the effect of driver education. It is possible that certain types of accidents also vary with age and experience and that such differences as there are between the groups are accounted for, not by training, but by the different stages of their driving career reached by the various groups.

6.10 Conclusions

In attempting to assess the effect of driver education on error free driving (as legally defined and observed), much has been learned about the role of cognitive factors in error free driving. Driver education was usually observed to be significantly related to a reduction in traffic offences. However an investigation into the nature of this relationship showed that it was one of association with a third variable, namely experience and exposure to risk, rather than a direct causal one. Traffic offences were related to experience and exposure to risk which had been reduced by driver education. However, in so far as the individual driver's chance of being charged with a traffic offence is dependent on his experience; training, by reducing mileage, may for the group as a whole, reduce the number of prosecutions in the short term but it has not been shown to affect the individual's involvement in traffic offences in the long term.

Thus, while the cognitive factor appears to be important in error free, as in accident free, driving, this has been shown to be derived mainly from the practical activity of driving rather than from classroom instruction in the form given to students in this experiment. There was some evidence to suggest that in the first 5,000 miles that trained students had fewer traffic offences than the other groups. Thus it would appear that in so far as driver education had been effective in reducing the number of traffic offences, it was in the short term only. The likelihood of being prosecuted declined with experience. When these prosecutions were subdivided according to the type of error committed, only the "pre-driving responsibilities" declined with experience. It was in those areas which are not central to the task of driving, e.g. taxation and

insurance requirements, construction and use regulations etc., where experience had been effective in informing the students about the way other systems impinge on the activity of driving. In so far as this type of driving error declined, it may be reasoned that young drivers learn more quickly how to conform to the standards of behaviour which are external to the driving task - probably because infringement of these standards are more readily observed and detected by others. It would appear that little had been learned on the course that was related to error free driving, as reflected negatively in prosecution free driving (type 5 charges), as opposed to success in reaching driving test standard. In so far as the cognitive factor has been shown to be important, it implies that in principle training ought to be capable of preparing a driver to drive in such a way as to avoid prosecutions for traffic offences.

This study has shown the critical importance of exposure to risk and driving experience for learning to avoid being charged with a traffic offence. There was little evidence to suggest that it was the individual characteristics of the young person per se which was responsible for prosecutions. The evidence points strongly to the activity of driving and the constraints of the car/road/traffic system as being primarily responsible for driving in such a way as to be charged with a traffic offence.

TABLE 6.9.1 AVERAGE TRAFFIC OFFENCE RATES (TYPE 1 AND 5) PER MILE AND PER MONTH OF DRIVING EXPERIENCE

	Pre boys	Con boys	Full boys	Sim boys	All boys	p	All girls
Type 1							
traffic offence rate per mile	.0037	.0015	.0033	.0029	.0026	> 0.05	.0012
traffic offence rate per month of driving experience	.0027	.0008	.0016	.0017	.0015	< 0.05	.0003
Type 5							
traffic offence rate per mile	.0110	.0124	.0110	.0057	.0115	> 0.05	.0065
traffic offence rate per month of driving experience	.0073	.0073	.0056	.0034	.0066	> 0.05	.0001

TABLE 6.9.2 TRAFFIC OFFENCE RATES (TYPE 1) PER 5000 MILE RANGE TRAVELLED FOR EACH GROUP

mileage		Pre boys	Con boys	Full boys	Sim boys	All boys	p	All girls
0-5	charge - type 1	1	6	5	0	12		1
	miles	414	925	832	58	2229		952
	rate	.0024	.0065	.0060	.0000	.0054		.0011
6-10	charge - type 1	1	0	2	0	3		2
	miles	357	761	630	50	1848		536
	rate	.0028	.0000	.0032	.0000	.0016		.0037
11-15	charge - type 1	1	1	2	0	4		0
	miles	305	636	506	45	1492		316
	rate	.0033	.0016	.0040	.0000	.0027		.0000
16-20	charge - type 1	2	0	1	1	4		0
	miles	278	541	451	40	1310		210
	rate	.0072	.0000	.0022	.0250	.0030		.0000
21-25	charge - type 1	1	0	0	0	1		0
	miles	244	455	325	30	1054		140
	rate	.0041	.0000	.0000	.0000	.0028		.0000
26-30	charge - type 1	2	0	2	0	4		0
	miles	215	400	279	25	919		91
	rate	.0093	.0000	.0072	.0000	.0044		.0000
31-35	charge - type 1	0	0	0	0	0		0
	miles	165	313	200	25	703		60
	rate	.0000	.0000	.0000	.0000	.0000		.0000
36-40	charge - type 1	1	0	0	0	1		0
	miles	137	274	159	25	595		40
	rate	.0073	.0000	.0000	.0000	.0017		.0000
41-45	charge - type 1	0	0	0	0	0		0
	miles	125	249	115	15	504		30
	rate	.0000	.0000	.0000	.0000	.0000		.0000
46-50	charge - type 1	0	0	0	0	0		0
	miles	120	193	101	10	424		24
	rate	.0000	.0000	.0000	.0000	.0000		.0000
51-55	charge - type 1	0	0	0	0	0		0
	miles	85	120	75	10	290		10
	rate	.0000	.0000	.0000	.0000	.0000		.0000
56-60	charge - type 1	0	0	0	0	0		0
	miles	75	115	70	5	265		10
	rate	.0000	.0000	.0000	.0000	.0000		.0000
61-65	charge - type 1	0	0	0	0	0		
	miles	50	80	55	5	200		
	rate	.0000	.0000	.0000	.0000	.0000		
66-70	charge - type 1	0	0	0	0	0		
	miles	50	72	49	5	176		
	rate	.0000	.0000	.0000	.0000	.0000		
71-75	charge - type 1	0	0	1	0	1		
	miles	30	55	35	0	120		
	rate	.0000	.0000	.0000	.0000	.0000		
76-80	charge - type 1	1	0	0	0	1		
	miles	20	40	30	0	90		
	rate	.05	.0000	.0000	.0000	.0111		
81-85	charge - type 1	0	0	0	0	0		
	miles	20	25	25	0	70		
	rate	.0000	.0000	.0000	.0000	.0000		
86-90	charge - type 1	0	0	0	0	0		
	miles	15	25	25	0	65		
	rate	.0000	.0000	.0000	.0000	.0000		
91-95	charge - type 1	0	0	0	0	0		
	miles	15	20	25	0	60		
	rate	.0000	.0000	.0000	.0000	.0000		
96-99	charge - type 1	0	0	0	0	0		
	miles	12	16	20	0	48		
	rate	.0000	.0000	.0000	.0000	.0000		

TABLE 6.9.3 TRAFFIC OFFENCE RATES (TYPE 1) PER 6 MONTHS OF DRIVING EXPERIENCE SINCE PASSING THE TEST FOR EACH GROUP

		Pre boys	Con boys	Full boys	Sim boys	All boys	p	All girls
0-6	charge - type 1	4	5	5	0	14		1
	months	559	1440	1267	84	3350		1952
	rate	.0072	.0035	.0039	.0000	.0042		.0005
7-12	charge - type 1	3	1	2	1	7		0
	months	532	1379	1321	84	3226		1943
	rate	.0056	.0007	.0016	.0119	.0022		.0000
13-18	charge - type 1	0	1	0	0	1		2
	months	508	1249	1204	82	3043		1826
	rate	.0000	.0008	.0000	.0000	.0003		.0011
19-24	charge - type 1	0	0	3	0	3		0
	months	487	1149	1149	78	2843		1704
	rate	.0000	.0000	.0026	.0000	.0011		.0000
25-30	charge - type 1	0	0	2	0	2		0
	months	450	1039	1113	77	2679		1553
	rate	.0000	.0000	.0000	.0000	.0007		.0000
31-36	charge - type 1	3	0	0	0	3		0
	months	355	872	1006	67	2300		1261
	rate	.0085	.0000	.0000	.0000	.0013		.0000
37-42	charge - type 1	0	0	1	0	1		0
	months	385	689	601	65	1740		880
	rate	.0000	.0000	.0017	.0000	.0006		.0000
43-48	charge - type 1	0	0	0	0	0		0
	months	332	499	224	36	1091		550
	rate	.0000	.0000	.0000	.0000	.0000		.0000
49-54	charge - type 1	0	0	0	0	0		0
	months	206	290	23	11	1130		241
	rate	.0000	.0000	.0000	.0000	.0000		.0000
55-60	charge - type 1	0	0	0	0	0		0
	months	95	167	0	0	262		71
	rate	.0000	.0000	.0000	.0000	.0000		.0000
61-66	charge - type 1	0	0	0	0	0		0
	months	36	58	0	0	94		20
	rate	.0000	.0000	.0000	.0000	.0000		.0000
67-72	charge - type 1	0	0	0	0	0		0
	months	9	31	0	0	40		13
	rate	.0000	.0000	.0000	.0000	.0000		.0000
73-78	charge - type 1	0	0	0	0	0		0
	months	0	6	0	0	6		6

TABLE 6.9.4 TRAFFIC OFFENCE RATES (TYPE 1) PER DRIVER PER 6 MONTHS OF AGE SINCE 17TH BIRTHDAY FOR EACH GROUP

months		Pre boys	Con boys	Full boys	Sim boys	Total boys	p	All girls
0-6	charge - type 1	0	0	1	0	1		0
	drivers	13	25	49	5	92		24
	rate	.0000	.0000	.0204	.0000	.0109		.0000
7-12	charge - type 1	2	0	3	0	5		1
	drivers	42	104	154	10	310		129
	rate	.0476	.0000	.0194	.0000	.0161		.0078
13-18	charge - type 1	3	2	3	0	8		1
	drivers	61	139	177	11	388		212
	rate	.0492	.0144	.0169	.0000	.0206		.0047
19-24	charge - type 1	0	1	0	0	1		1
	drivers	66	162	187	13	428		245
	rate	.0000	.0062	.0000	.0000	.0023		.0041
25-30	charge - type 1	0	0	3	0	3		0
	drivers	69	131	192	13	455		276
	rate	.0000	.0000	.0156	.0000	.0066		.0000
31-36	charge - type 1	0	2	2	0	4		0
	drivers	75	201	200	14	490		290
	rate	.0000	.0100	.0100	.0000	.0082		.0000
37-42	charge - type 1	4	2	0	1	7		0
	drivers	78	215	197	14	504		299
	rate	.0513	.0093	.0000	.0714	.0139		.0000
43-48	charge - type 1	0	0	0	0	0		0
	drivers	82	198	147	14	441		269
	rate	.0000	.0000	.0000	.0000	.0000		.0000
49-54	charge - type 1	0	0	0	0	0		0
	drivers	80	156	87	8	331		191
	rate	.0000	.0000	.0000	.0000	.0000		.0000
55-60	charge - type 1	1	0	0	0	1		0
	drivers	78	110	23	2	213		125
	rate	.0128	.0000	.0000	.0000	.0047		.0000
61-66	charge - type 1	0	0	1	0	1		0
	drivers	50	58	2	0	110		61
	rate	.0000	.0000	.5000	.0000	.0091		.0000
67-72	charge - type 1	0	0	0	0	0		0
	drivers	21	20	2	0	43		17
	rate	.0000	.0000	.0000	.0000	.0000		.0000
73-78	charge - type 1	0	0	0	0	0		0
	drivers	6	10	1	0	17		4
	rate	.0000	.0000	.0000	.0000	.0000		.0000

TABLE 6.9.5 TRAFFIC OFFENCE RATES (TYPE 5) PER 5000 MILE RANGE TRAVELLED FOR EACH GROUP

		Pre boys	Con boys	Full boys	Sim boys	All boys	p	All girls
0-5	charge - type 5	2	22	10	0	34		9
	miles	414	725	832	58	2229		952
	rate	.0048	.0303	.0120	.0000	.0144		.0095
6-10	charge - type 5	6	6	10	0	22		3
	miles	357	761	630	50	1848		536
	rate	.0168	.0079	.0159	.0000	.0119		.0056
11-15	charge - type 5	5	8	5	0	18		1
	miles	305	636	506	45	1492		316
	rate	.0476	.0126	.0099	.0000	.0121		.0032
16-20	charge - type 5	0	6	5	0	11		0
	miles	278	541	451	40	1310		210
	rate	.0000	.0111	.0111	.0000	.0084		.0000
21-25	charge - type 5	9	3	2	0	14		0
	miles	244	455	325	30	1054		140
	rate	.0369	.0066	.0062	.0000	.0133		.0000
26-30	charge - type 5	3	7	5	0	15		1
	miles	215	400	279	25	919		91
	rate	.0140	.0175	.0179	.0000	.0163		.011
31-35	charge - type 5	0	0	1	0	1		1
	miles	165	313	200	25	703		60
	rate	.0000	.0000	.0050	.0000	.0014		.0167
36-40	charge - type 5	1	6	2	1	10		1
	miles	137	274	159	25	595		40
	rate	.0073	.0219	.0126	.04	.0168		.025
41-45	charge - type 5	0	1	0	0	1		
	miles	125	249	115	15	504		
	rate	.0000	.0040	.0000	.0000	.0020		
46-50	charge - type 5	1	4	0	0	5		
	miles	120	193	101	10	424		
	rate	.0083	.0207	.0000	.0000	.0118		
51-55	charge - type 5	0	1	0	0	1		
	miles	25	120	75	10	290		
	rate	.0000	.0083	.0000	.0000	.0034		
56-60	charge - type 5	1	0	0	0	1		
	miles	75	115	70	5	265		
	rate	.0133	.0000	.0000	.0000	.0038		
61-65	charge - type 5	0	0	0	0	0		
	miles	50	80	55	5	200		
	rate	.0000	.0000	.0000	.0000	.0000		
66-70	charge - type 5	1	0	1	0	2		
	miles	50	72	49	5	176		
	rate	.0200	.0000	.0204	.0000	.0114		
71-75	charge - type 5	0	1	0	0	1		
	miles	30	55	35	0	120		
	rate	.0000	.0182	.0000	.0000	.0083		
76-80	charge - type 5	1	1	0	0	2		
	miles	20	40	30	0	90		
	rate	.0500	.0250	.0000	.0000	.0222		
81-85	charge - type 5	0	0	0	0	0		
	miles	20	25	25	0	70		
	rate	.0000	.0000	.0000	.0000	.0000		
86-90	charge - type 5	0	0	2	0	2		
	miles	15	25	25	0	65		
	rate	.0000	.0000	.0800	.0000	.0308		
91-95	charge - type 5	0	0	0	0	0		
	miles	15	20	25	0	60		
	rate	.0000	.0000	.0000	.0000	.0000		
95-99	charge - type 5	0	0	1	0	1		
	miles	12	16	20	0	48		
	rate	.0000	.0000	.0500	.0000	.0208		

TABLE 6.9.6 TRAFFIC OFFENCE RATES (TYPE 5) PER 6 MONTHS OF DRIVING EXPERIENCE SINCE PASSING THE TEST FOR EACH GROUP

		Pre boys	Con boys	Full boys	Sim boys	All boys	p	All girls
0-6	charge - type 5	1	17	3	0	21		4
	months	559	1440	1267	84	3350		1952
	rate	.0018	.0118	.0024	.0000	.0063		.002
7-12	charge - type 5	6	9	9	0	24		4
	months	532	1379	1231	84	3226		1943
	rate	.0113	.0065	.0073	.0000	.0074		.0021
13-18	charge - type 5	11	12	9	0	32		1
	months	508	1249	1204	82	3043		1826
	rate	.0217	.0096	.0075	.0000	.0105		.0038
19-24	charge - type 5	2	3	5	0	10		0
	months	487	1149	1149	78	2843		1704
	rate	.0041	.0026	.0044	.0000	.0035		.0000
25-30	charge - type 5	5	9	6	0	20		1
	months	450	1039	1113	77	2679		1553
	rate	.0111	.0087	.0054	.0000	.0075		.0006
31-36	charge - type 5	0	3	5	1	8		3
	months	355	872	1006	67	2300		1261
	rate	.0000	.0034	.0050	.0149	.0035		.0024
37-42	charge - type 5	1	5	7	0	13		0
	months	385	689	601	65	1740		880
	rate	.0026	.0015	.0116	.0000	.0075		.0000
43-48	charge - type 5	1	3	0	0	4		3
	months	332	499	224	36	1091		550
	rate	.0030	.0060	.0000	.0000	.0037		.0055
49-54	charge - type 5	2	3	0	0	5		0
	months	206	290	23	11	1130		241
	rate	.0097	.0103	.0000	.0000	.0044		.0000
55-60	charge - type 5	1	1	0	0	2		0
	months	95	167	0	0	262		71
	rate	.0105	.0060	.0000	.0000	.0076		.0000
61-66	charge - type 5	0	0	0	0	0		0
	months	36	58	0	0	94		20
	rate	.0000	.0000	.0000	.0000	.0000		.0000
67-72	charge - type 5	0	0	0	0	0		0
	months	9	31	0	0	40		6
	rate	.0000	.0000	.0000	.0000	.0000		.0000

TABLE 6.9.7 TRAFFIC OFFENCE RATES (TYPE 5) PER DRIVER PER 6 MONTHS OF AGE SINCE 17TH BIRTHDAY FOR EACH GROUP

		Pre boys	Con boys	Full boys	Sim boys	Total boys	p	All girls
0-6	charge - type 5	1	2	0	0	3		1
	drivers	12	25	49	5	92		24
	rate	.0833	.0800	.0000	.0000	.0326		.0417
7-12	charge - type 5	2	11	2	0	15		2
	drivers	42	104	154	10	310		129
	rate	.0476	.1058	.0130	.0000	.0484		.0155
13-18	charge - type 5	5	9	11	0	25		2
	drivers	61	139	177	11	388		212
	rate	.0820	.0647	.0621	.0000	.0644		.0094
19-24	charge - type 5	6	6	8	0	20		1
	drivers	66	162	187	13	428		245
	rate	.0909	.0370	.0428	.0000	.0467		.0041
25-30	charge - type 5	3	8	4	0	15		0
	drivers	69	181	192	13	455		276
	rate	.0435	.0442	.0208	.0000	.0330		.0000
31-36	charge - type 5	3	7	4	0	14		3
	drivers	75	201	200	14	490		290
	rate	.0400	.0348	.0200	.0000	.0286		.0103
37-42	charge - type 5	1	9	4	1	15		2
	drivers	78	215	197	14	504		299
	rate	.0128	.0419	.0203	.0714	.0298		.0067
43-48	charge - type 5	2	4	11	1	18		0
	drivers	82	198	147	14	441		269
	rate	.0244	.0202	.0748	.0714	.0408		.0000
49-54	charge - type 5	4	4	0	0	8		4
	drivers	80	156	87	8	331		191
	rate	.0500	.0256	.0000	.0000	.0242		.0209
55-60	charge - type 5	2	5	0	0	7		1
	drivers	78	110	23	2	213		125
	rate	.0256	.0455	.0000	.0000	.0329		.008
61-66	charge - type 5	0	0	0	0	0		0
	drivers	50	58	2	0	110		61
	rate	.0000	.0000	.0000	.0000	.0000		.0000
67-72	charge - type 5	1	0	0	0	1		0
	drivers	21	20	2	0	43		17
	rate	.0476	.0000	.0000	.0000	.0233		.0000

FIGURE 6.9.1 TRAFFIC OFFENCE RATE (TYPE 1) PER 5000 MILES RANGE FOR EACH OF THE BOYS' GROUPS

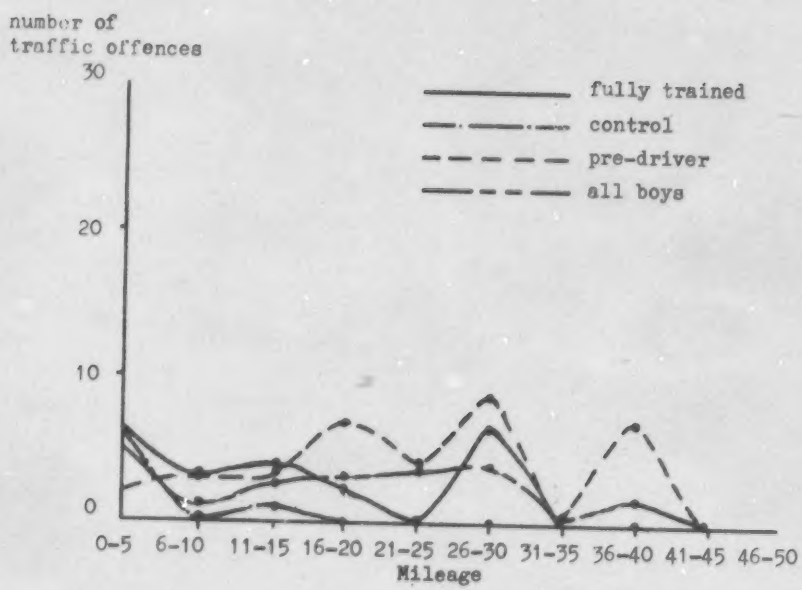


FIGURE 6.9.2 TRAFFIC OFFENCE RATE (TYPE 1) PER 6 MONTHS OF DRIVING EXPERIENCE FOR EACH OF THE BOYS' GROUPS

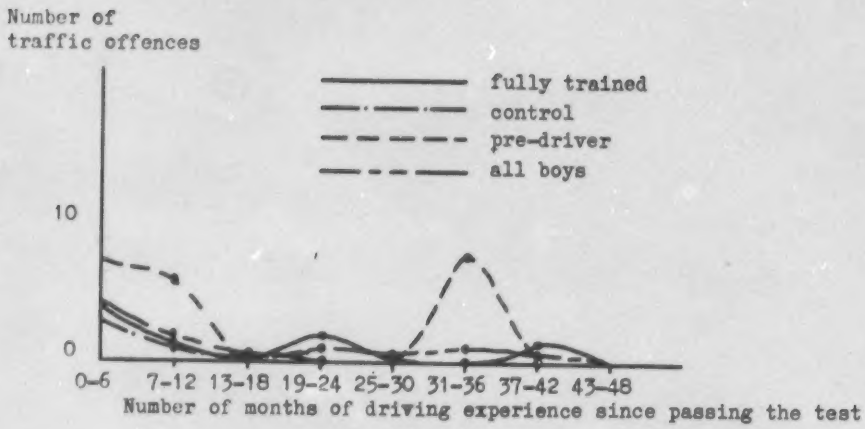


FIGURE 6.9.5 TRAFFIC OFFENCE RATES (TYPE 5) PER 6 MONTHS OF DRIVING EXPERIENCE FOR EACH OF THE BOYS' GROUPS

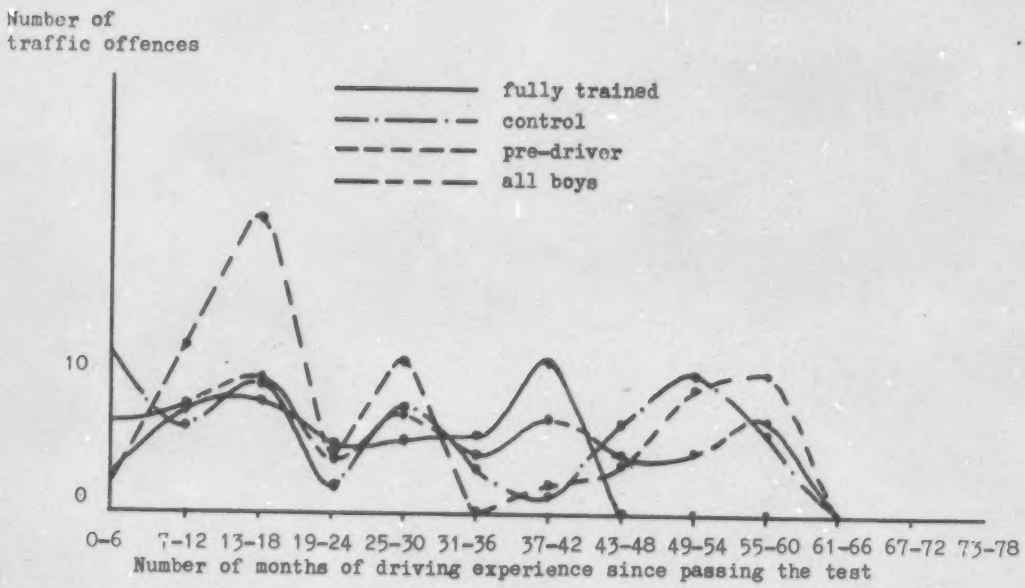


FIGURE 6.9.3 TRAFFIC OFFENCE RATES (TYPE 1) PER DRIVER PER 6 MONTHS OF AGE SINCE 17TH BIRTHDAY FOR EACH OF THE BOYS' GROUPS

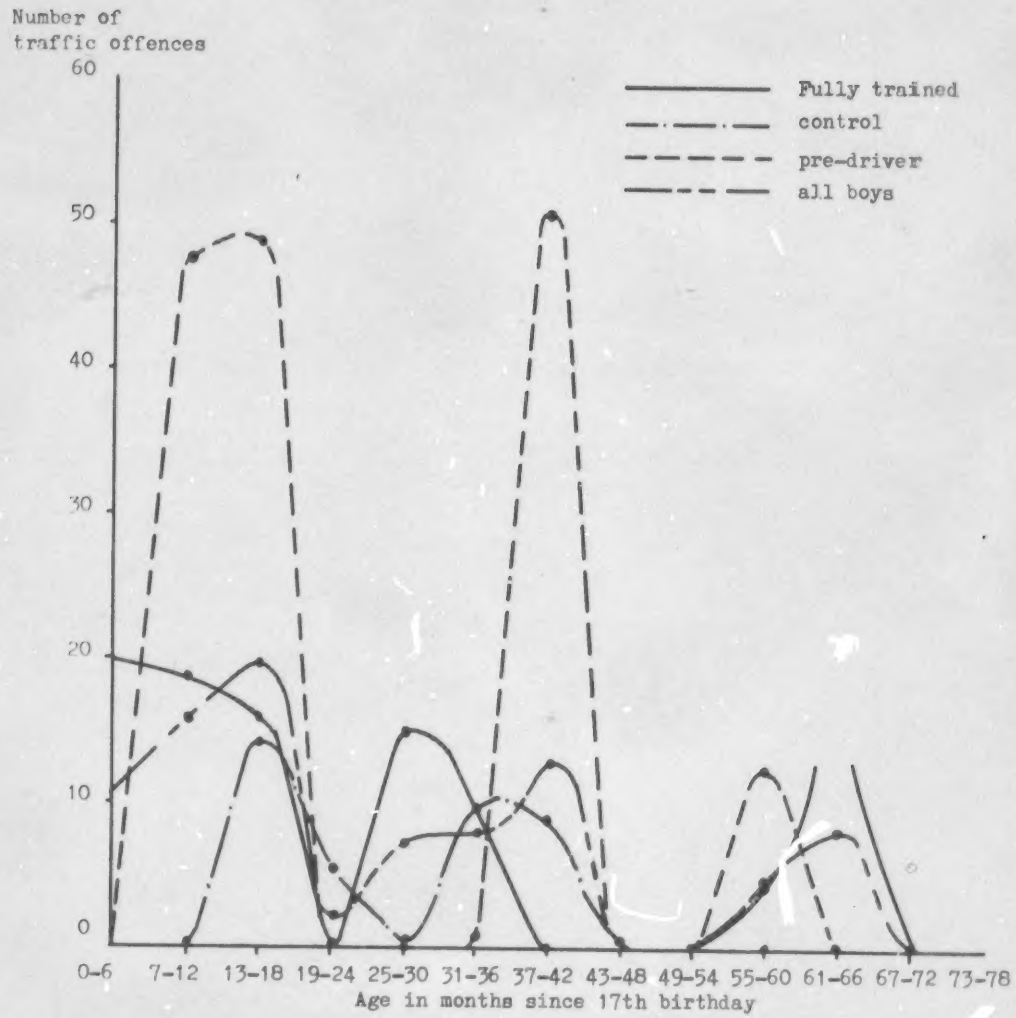


FIGURE 6.9.4 TRAFFIC OFFENCE RATE (TYPE 5) PER 5000 MILES RANGE DRIVEN FOR EACH OF THE BOYS' GROUPS

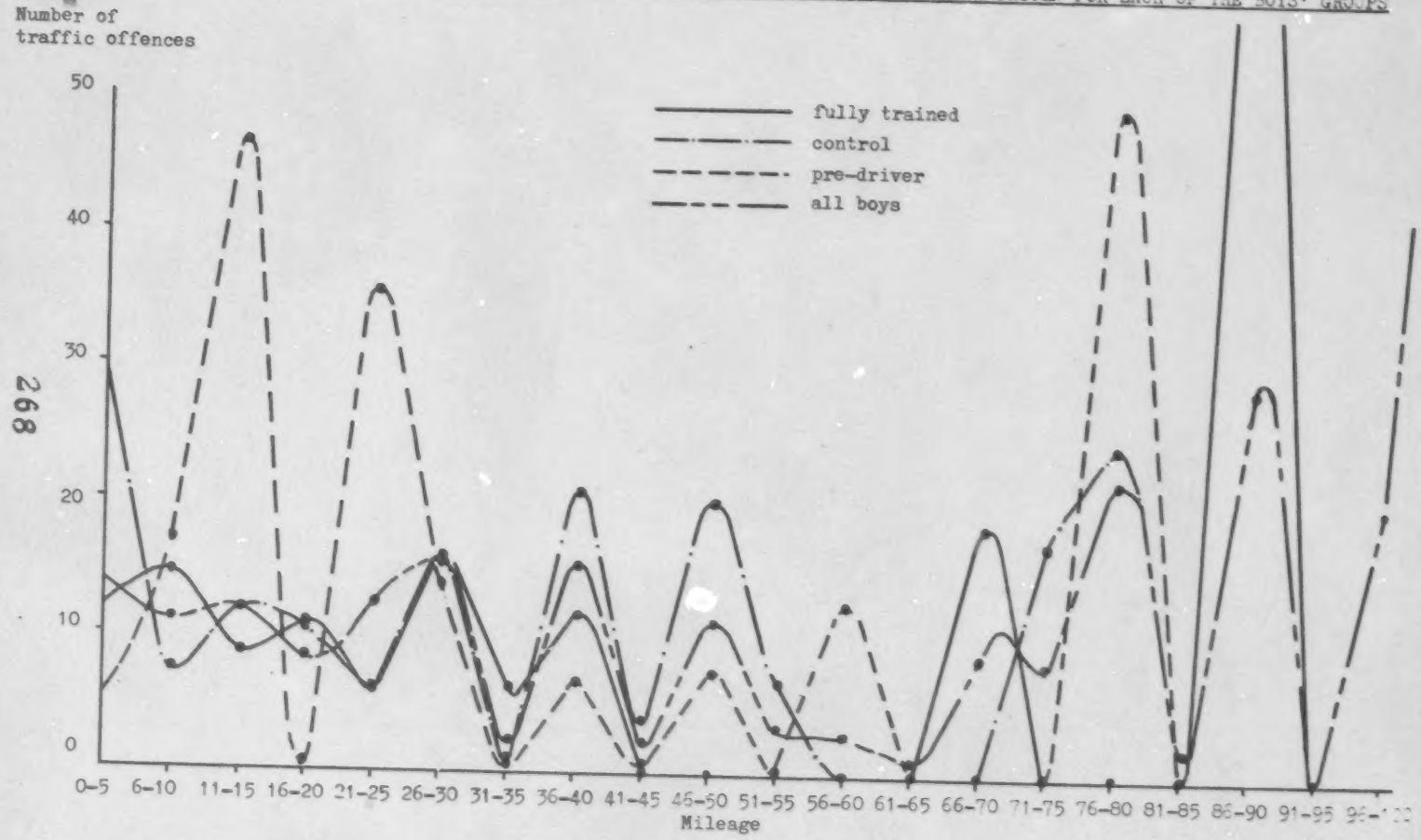
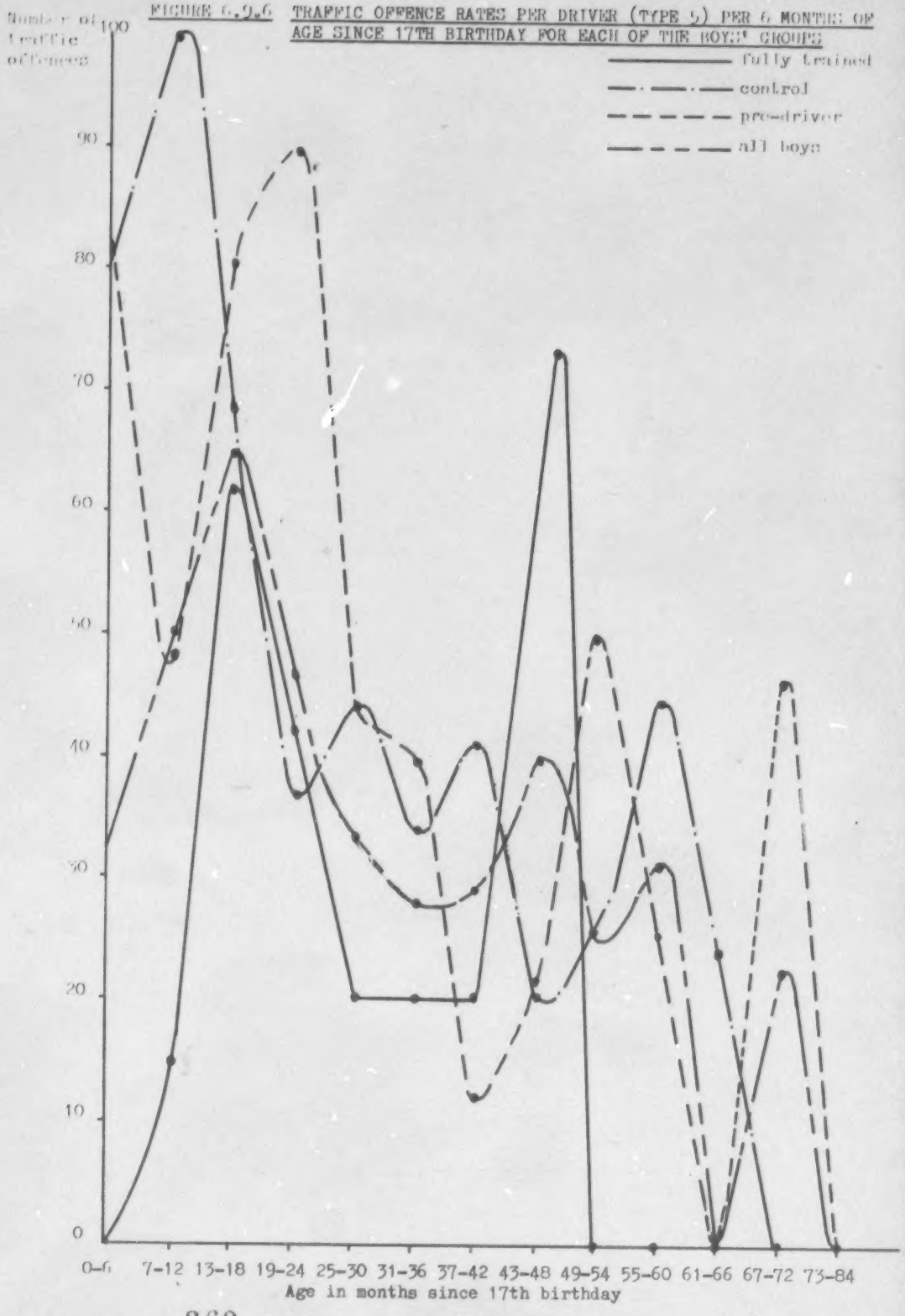


FIGURE 6.9.6 TRAFFIC OFFENCE RATES PER DRIVER (TYPE 5) PER 6 MONTHS OF AGE SINCE 17TH BIRTHDAY FOR EACH OF THE BOYS' GROUPS



CHAPTER SEVEN THE RELATIONSHIP BETWEEN ACCIDENTS AND TRAFFIC OFFENCES

Since the main interest in driver education is in its accident reduction potential, all the other criteria have been included so that the process whereby driver education has any effect (if at all) on accidents may be observed and their relationship to accidents examined, in particular the relationship between traffic offences and accidents.

Tables 7.1.1, 7.1.2, 7.1.3, 7.1.4 and 7.1.5 show the number of boys in the pre-driver, control, fully trained and simulator trained groups and the entire male sample, respectively, who had been involved in an accident and/or traffic offence. Chi-square tests of association were used to test the significance of the relationship between accidents and traffic offences. Except in the case of the fully trained and simulator trained boys, this relationship was significant at the 5% level, i.e. in those groups where the level of experience was highest, the association was significant. This suggests that accidents and traffic offences are related and that the likelihood of being involved in both an accident and a traffic offence is not solely due to chance.

Tables 7.1.6 - 7.1.10 show the number of girls in the pre-driver, control, fully trained and simulator trained groups and in the entire female sample, respectively, who had been involved in an accident and/or traffic offence. Chi-square tests of association were used to test the significance of the relationship between accidents and traffic offences. Only in the case of the entire female sample was this association significant at the 5% level, confirming the trend noted above, that only when the level of experience is high, is the association significant. This suggests that accidents and traffic offences are related and that the likelihood of being involved in both is not solely due to chance.

Thus, using this method, it has been possible to test whether there is a significant relationship between nominal variables. Once it has been shown by means of the X^2 criterion that a correlation between such variables is significant, it is desirable to obtain some measure of the strength of the relationship. The contingency coefficient is another measure of correlation and is given by:-

$$C = \sqrt{\frac{X^2}{X^2 + N}}$$

Where N is the total number of observations and X^2 is the value obtained from the contingency tables as a nominal statistic, it is independent of the ordering of the rows and columns of the contingency table.

Contingency coefficients are in many respects similar to ordinary correlation coefficients, being close to 0 when there is no correlation and close to 1 when the relationship is strong. To interpret C correctly, it is worth noting that for contingency tables having relatively few rows and columns, the maximum value of C is less than 1. For a 2 x 2 table, a perfect correlation would yield C = 0.707 and for a 3 x 3 table, C = 0.816. (The fact that the correlation is significant was shown previously by means of the X^2 criterion). As the number of categories increase, C approaches 1. The dependence of C on the number of categories raises difficulties of interpretation. It means that the different values of C are not directly comparable unless based on tables having the same number of rows and columns. Thus a contingency coefficient based on a 2 x 2 table may be based directly with another such table based on a 2 x 2 table but not one based on, say, a 3 x 3 table.

Table 7.1.11 shows whether the association between traffic offences and accidents are significant, the contingency coefficient and the size of the contingency table used to calculate C (since the smaller cell frequencies

were combined in one class) for each of the groups in the sample. Generally speaking, the highest correlation is between those groups with the most driving experience. Thus to a certain extent, the relationship between traffic offences and accidents is dependent upon having an adequate sample from which to derive these unsafe practices, i.e. a high mileage. Since these two criteria are related, it seems that traffic offences are also samples of unsafe driving practices and are also therefore valid indices of driving performance. Traffic offences are therefore a useful criterion and measure another related aspect of driving.

An alternative interpretation which cannot yet be ruled out does also exist. It may be that this relationship is greater than one would expect by chance because many of the traffic offences come to light because of accident involvement. Table 7.1.12 shows the number and percentage of accidents in the various groups which resulted in a traffic offence. This was derived from the answers to the question asking whether they had been charged with a traffic offence as a result of the accident. Some of them did not know at the time of the survey whether they would be prosecuted or not. Hence Table 7.1.13 shows four more traffic offences. These were reported at a subsequent contact. It can be seen from Table 7.1.12 that the percentage of accidents resulting in prosecution is very small. This is to be expected since most of the accidents were very trivial. The fully trained boys had fewer accidents resulting in prosecutions than the other groups, but these differences were not greater than could be expected by chance. However, this tends to confirm the trend noted earlier, that the fully trained boys were involved in fewer serious accidents than the other groups. Interestingly enough, the same proportion of the girls' accidents as the boys' accidents resulted in prosecutions. Yet, the girls were not found to be involved in the same proportion of serious accidents as the boys (serious damage, although not injury accidents).

Table 7.1.13 shows the percentage of prosecutions that arose out of an accident. Again, this was fairly low and reflects the trivial nature of most of the traffic offences and the fact that many of these offences were speeding offences. Although these figures are very different from Willett's study (1964), it should be remembered that his study was concerned with very much more serious offences which by their nature come to light because of an accident. There is some variation within the boys' and girls' sample but this was not found to be significant. It should be noted that a higher proportion of the girls' than the boys' traffic offences arose out of an accident. But again this difference was not significant. It is interesting that when Tables 7.1.12 and 7.1.13 are compared, that the proportion of traffic offences arising out of accidents is higher than the proportion of accidents giving rise to traffic offences. This is because there are many more accidents reported in this study than traffic offences.

Table 7.1.14 shows the percentage of people who had been involved in both an accident and a traffic offence, whose accident resulted in a prosecution. There was some variation within the boys' and girls' samples but not so great as to achieve statistical significance. When the total samples are considered, it can be seen that about one third of those boys who had been involved in both an accident and a traffic offence had been charged as a result of this accident. It is interesting that this percentage is about the same as in the previous analysis.

These young people are removed from the sample in order to ascertain whether the relationship between accidents and traffic offences is still greater than could be expected by chance. Table 7.1.15 shows the number of boys who had been involved in both an accident and a traffic offence, less those boys whose accident resulted in a prosecution. A chi-square test showed that

this relationship was still significant at the 5% level. The contingency coefficient was 0.16. Thus the association between traffic offences and accidents noted earlier cannot be explained simply by the fact that the prosecutions arose out of the accidents. Consequently there is some evidence to suggest that the use of traffic offences as another intermediate criterion of unsafe practices is justifiable.

Table 7.1.16 shows the number of girls in the sample who had been involved in both an accident and a traffic offence, less those girls whose accident resulted in a prosecution. A chi-square test of association showed that this relationship was no longer significant at the 5% level. Thus, in the case of the girls, the alternative interpretation of the relationship between traffic offences and accidents (Table 7.1.10) must be upheld - namely that the same incident gave rise to both an accident and traffic offence. It was not a relationship between two independent events.

Thus, out of 570 male drivers, 291 had been involved in at least one accident. Of these 291 drivers, 142 had been charged with a traffic offence. Thus about 49% of the boys who had been involved in an accident (although not necessarily responsible for it) had also been prosecuted for some offence relating to driving. This results in 2.4 accidents per charge. Given the very trivial nature of most of these accidents, this would suggest that the efforts of the police in detecting unsafe practices are aimed at the right people. Only 15% (i.e. 42 out of 275) of those who had not been involved in an accident were charged. This results in 1 charge per 6.5 accident free people. A chi-square test showed that the difference between these rates (i.e. prosecution rate per accident and non-accident involved boys) was significant. Even when these rates are adjusted for the number of prosecutions that arose out of accidents, the difference is still significant. Thus the police appear to be able to discriminate between accident and non-accident boys by means of prosecutions for traffic offences, although the nature of the charges themselves appear to be very arbitrary.

Out of 351 female drivers, 104 had been involved in at least one accident. Of these 104 drivers, 11 had been charged with at least one traffic offence. Thus about 11% of the girls who had been involved in an accident (although not necessarily legally responsible for it) had also been prosecuted. This results in 9 accidents per charge. Only 3% of those not involved in an accident (i.e. 7 out of 247) were charged. This results in 1 charge per 35 accidents. Again, the difference between these rates is significant. However, since Table 7.1.13 showed that 7 of the girls' traffic offences arose out of accidents this difference in the ability of the police to identify accident-involved drivers is illusory in the case of the girls.

When the number of boys who have ever been charged with a traffic offence is compared with the number who had ever been involved in an accident, (i.e. 291 as opposed to 142) it can be seen that twice the number of boys had been involved in an accident as had been charged with a traffic offence. In the case of the girls, 104 girls had been involved in an accident, but only 18 had been prosecuted. Thus, nearly six times the number of girls had been involved in an accident as had been charged with a traffic offence. This tends to suggest that accidents (i.e. collisions) are a better intermediate criterion for unsafe practices than are traffic offences.

In the opinion of many of the students who were charged, traffic law appeared to be very haphazardly enforced and this certainly created some discontent with the system. The relationship of traffic law enforcement and accidents is an area which needs further study. Perhaps if certain manoeuvres were isolated which were found to be more likely to result in accidents than others, e.g. keeping an adequate distance behind the car in front, and some

simple device could be found to measure this accurately and thereby make it possible to enforce this aspect of driving, this might be a useful way of ensuring certain minimum standards of behaviour on the roads which could be seen to be related to accidents. Unfortunately, at the moment, those aspects of the law which are easier to enforce are not always those which the motoring public sees as the most relevant to the accident situation. The role of traffic law and its enforcement as a deterrent also needs to be studied, e.g. the number of drivers who will not stop for a pedestrian who is waiting to cross the road at a pedestrian crossing or who will cross the lights on red when police are not present compared with the number when the police are present and the same people at the next pedestrian crossing or the next set of lights.

Nevertheless the relationship between accidents and traffic offences is of very great interest and importance despite the unreliability (or unknown reliability) of both of these indices of unsafe driving behaviour. If in fact, as has been suggested, the enforcement of the law with regard to motoring is not randomly enforced, it may indicate that the police use some other means by which they pick out the more dangerous drivers. These may be based on their own idiosyncracies and predilections but it should also be borne in mind that the traffic police have undergone special training as drivers and are very much more knowledgeable and experienced drivers than the general population. It is possible that they are bringing some of this knowledge to bear on the selection and identification of unsafe drivers over and above that defined by the law.

In addition, the relationship between accidents and traffic offences is of interest because it suggests that people's driving can be generalised and that their behaviour on the roads is fairly consistent. Perhaps this relationship indicates that accidents are not as unreliable a criterion as has been suggested. It seems that people who have a propensity for accidents can be identified by the police, although it is not known by what process this is done, since complete enforcement of the law is not attempted. A study of the way in which the police enforce traffic laws would be very worthwhile. It is of interest that the one group - the fully trained boys - for which no significant relationship between the two criteria was found to exist was the one that had driven the least. The girls had driven very little and had been charged with very few offences. It is unlikely that a close relationship would exist between their accidents and traffic offences. In other words, the police were least successful in selecting those who had been involved in an accident (before or after the accident occurred? whose exposure to risk was small.

Although it appears from this study that the police are reasonable accurate in identifying by means of traffic offences the unsafe drivers, no claim is being made here that they are able to do this before the accident has occurred. In fact, this is the chief value of this relationship, that driving performance is sufficiently stable for these two types of events which occur at different periods in time - although within a maximum of 5 years but usually much less - to involve the same people.

The fact that such a relationship appears to exist has several important implications for driver training. Since these two variables agree so closely in identifying the unsafe drivers, accidents would appear to be due to certain behavioural patterns rather than just chance events. This would imply that road safety can be increased by suitable training. In addition, the ability of the police to identify fairly accurately, after very short observations, the dangerous drivers suggests that driving tests can be designed which would have some predictive ability with respect to accidents. If such assessments are to be relevant to the needs of instructors in diagnosing the areas needing further attention, such tests must be capable of predicting the type of accident by identifying the types of errors made. Assessments of new drivers'

proficiency which are valid, reliable and easily administered are a vital prerequisite for training in such a vulnerable task. Since accidents are a behavioural problem, it would appear that some psychological characteristics are likely to be associated with different types of accidents (probably dependent on the type of error involved). If any such characteristics could be identified, then presumably extra attention could be paid during training to those aspects of driving where particular students are likely to have the greatest difficulty.

Since traffic offences and accidents are related, it seems that it is worthwhile to use the laws relating to driving as a means of promoting safety. Given that these laws cover such a wide range of activities and are probably incapable of being completely enforced, it is imperative that such enforcement as does exist should be directed in the appropriate direction. It seems that if traffic law is to be effective in ensuring minimum standards of behaviour on the roads, traffic offences and road safety must, in the eyes of the public, be seen to be related. Perhaps new drivers could be taught in the early stages of learning to drive why and how such practices are dangerous and the consequent necessity of legal restraint on people's driving behaviour. If once having committed an offence, these young drivers learn from experience, this would be worthwhile. But it implies they know or have been taught the law regarding motoring, understand how it relates to their own driving and to the safety of others and that this point can be brought home to them after they have committed an offence. However knowledge and practical performance are not always closely related. The number of speeding offences illustrates this point.

One of the problems in teaching driving is that procedures taught in the early stages of learning to drive do not always, in fact very rarely, result in accidents if incorrectly performed. Consequently there is no reinforcement of the necessity for carrying out a right or left turn in a specific way. From an educational point of view, this is an inappropriate way of learning to drive safely. Similarly with traffic offences, the likelihood of being caught for transgressing the traffic laws is so remote that the aim becomes that of avoiding detection rather than obeying the law. It seems likely that the traffic laws are less completely enforced relative to the amount of times offences are committed than any other aspect of the law. Given this, it is unlikely that the operation of the law will achieve the desired results.

This analysis has shown that driver education has little effect on traffic offence involvement (in this it is also similar to accident involvement) which cannot be otherwise explained by the different exposure to risk of the various groups. This again points to the great difficulty in using accidents and traffic offences as criteria by which driver education should be evaluated. Obviously reductions in the number of traffic offences and accidents are desirable effects, but it seems most unlikely that studies of this type can ever hope to measure this.

Since the likelihood of being charged with a traffic offence is closely related to the chance of being involved in an accident, it is important to teach new drivers to avoid the kinds of behaviour which are likely to result in their being prosecuted. It might also be relevant for training purposes to show that this relationship does exist and that the traffic laws are not therefore useless and arbitrary.

About 25% of inexperienced male drivers were prosecuted for some offence relating to driving within a very short time of passing the test. This suggests that driving is an activity which is likely to bring them into contact with the police. It seems likely for a sample such as this, that it is this aspect of the law which is most likely to result in their being

prosecuted. Since it is such a frequent occurrence, it seems that some emphasis ought to be placed during training on inculcating modes of thought and behaviour with respect to driving which is less likely to involve them breaking the law.

It is noticeable that traffic offences and in particular, the most important category, driving errors, declined with experience or age. This would suggest that certain aspects of their driving performance does improve with practice. It is interesting that "predriving responsibilities" improved with practice and age. Thus traffic offences, like accidents, often arise out of activities which are not central to the task of driving as such. That is drivers learn by experience about the role of factors other than those directly central to the car/road system. The task of training should be to minimise the part played by experience. This implies taking into account other systems external to the activity of driving.

Table 7.1.1 : Number of Predriver Boys who were involved in a car accident and traffic offence

Accident \ Traffic Offence	0	1	2	3	4	5	Total
0	35	2	3	0	0	0	40
1	21	5	2	0	0	0	28
2	10	5	0	1	1	0	17
3	1	3	0	0	0	1	5
4	0	1	3	0	0	0	4
5	0	1	0	0	0	0	1
Total	67	17	8	1	1	1	95

Table 7.1.2 : Number of Control Boys who were involved in a car accident and traffic offence

Accident \ Traffic Offence	0	1	2	3	Total
0	107	16	1	0	124
1	49	26	3	0	78
2	18	10	3	0	31
3	4	1	1	0	6
4	1	1	0	0	2
5	2	0	0	1	3
6	0	0	0	1	1
Total	181	54	8	2	245

Table 7.1.3 : Number of fully trained Boys who were involved in a car accident and a traffic offence

Accident \ Traffic Offence	0	1	2	3	Total
0	90	14	4	2	110
1	60	12	2	0	74
2	15	7	4	0	26
3	3	1	1	0	5
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	1	0	0	0	1
Total	169	34	11	2	216

Table 7.1.4 : Number of simulator trained Boys who were involved in a car accident and a traffic offence

Accident \ Traffic Offence	0	1	2	Total
0	5	0	0	5
1	6	0	0	6
2	0	1	1	2
3	0	1	0	1
Total	11	2	1	14

Table 7.1.5 : Number of Boys (total sample) who had been involved in a car accident and a traffic offence

Accident \ Traffic Offence	0	1	2	3	4	5	Total
0	237	32	8	2	0	0	279
1	136	43	7	0	0	0	186
2	43	23	8	1	1	0	76
3	8	6	2	0	0	1	17
4	1	2	3	0	0	0	6
5	2	1	0	1	0	0	4
6	0	0	0	1	0	0	1
7	0	0	0	0	0	0	0
8	1	0	0	0	0	0	1
Total	428	107	28	5	1	1	570

Table 7.1.6 : The number of predriver trained Girls who had been involved in a car accident and a traffic offence

Accident \ Traffic Offence	0	1	Total
0	15	1	16
1	5	0	5
2	1	1	2
Total	21	2	23

Table 7.1.7 : The number of control Girls who had been involved in a car accident and a traffic offence

Accident \ Traffic Offence	0	1	2	Total
0	116	1	1	118
1	41	1	0	42
2	9	1	0	19
3	1	1	0	2
4	2	1	0	3
Total	169	5	1	175

Table 7.1.8 : The number of fully trained Girls who had been involved in a car accident and a traffic offence

Accident \ Traffic Offence	0	1	2	Total
0	99	3	1	103
1	23	4	0	27
2	6	1	0	7
3	0	0	0	0
4	1	0	0	1
Total	129	8	1	138

Table 7.1.9 : Number of simulator trained Girls who had been involved in a car accident and a traffic offence

Accident \ Traffic Offence	0	1	Total
0	10	0	10
1	4	0	4
2	0	1	1
Total	14	1	15

Table 7.1.10 : Number of Girls (total sample) who had been involved in a car accident and a traffic offence.

Accident \ Traffic Offence	0	1	2	Total
0	240	5	2	247
1	73	5	0	78
2	16	4	0	20
3	1	1	0	2
4	3	1	0	4
Total	333	16	2	351

Table 7.1.11 : Contingency coefficient of association between accidents and traffic offences for each of the various groups

Group	χ^2	C	R x C
predriver trained boys	<0.05	0.07	4 x 3
control boys	<0.05	0.313	4 x 3
fully trained boys	>0.05	0.18	4 x 3
simulator trained boys	>0.05	0.35	2 x 2
All boys	<0.05	0.27	4 x 3
predriver trained girls	>0.05	0.00	3 x 2
control girls	>0.05	0.17	3 x 2
fully trained girls	>0.05	0.16	3 x 2
simulator trained girls	>0.05	0.28	2 x 2
All girls	<0.05	0.28	3 x 2

Table 7.1.12 : Number and percentage of accidents which resulted in a prosecution in each of the groups

Number of:	Predriver	Control	Fully trained	Simulator	Total
Boys: accidents resulting in a prosecution	5 5%	16 9%	6 4%	1 8%	28 6%
Girls: accidents resulting in a prosecution	1 11%	2 3%	4 9%	0 0%	7 5%

Table 7.1.13 : Number and percentage of prosecutions arising out of accidents in each of the groups

Number of:	Predriver	Control	Fully trained	Simulator	Total
Boys: charged as a result of an accident	5 11%	18 23%	8 13%	1 25%	32 17%
Girls: charged as a result of an accident	1 50%	2 29%	4 4%	——	7 35%

Table 7.1.14 : Percentage of people who had been involved in both an accident and a traffic offence, whose accident resulted in a prosecution

	Predrive:	Control	Fully trained	Simulator	Total
BOYS					
Number of offences arising out of accidents	5	18	8	1	32
Number who had been involved in both	23	47	27	3	100
% whose accident resulted in prosecution	22%	38%	30%	33%	32%
GIRLS					
Number of offences arising out of accidents	1	2	4	0	7
Number who had been involved in both	1	4	5	1	11
% whose accident resulted in prosecution	100%	50%	80%	0%	64%

Table 7.1.15 : The number of Boys in the sample who had been involved in a car accident and a traffic offence, less those boys whose accident resulted in a traffic offence

Accident \ Traffic Offence	0	1 or more	
0	237	40	$p < 0.05$
1 or more	191	70	$c = 0.16$

Table 7.1.16 : The number of Girls in the sample who had been involved in a car accident and a traffic offence, less those girls who accident resulted in a traffic offence

Accident \ Traffic Offence	0	1 or more
0	240	7
1 or more	93	4

CHAPTER EIGHT GENERAL CONCLUSIONS AND DISCUSSION

The previous chapters have attempted to examine more closely the types of data which may be used to assess the longer term effects of a course in driver education. Recourse was had to two types of measures, namely accidents and traffic offences. Self-reported data and data collected by interviewers on the groups' accidents and traffic offences were collected in order to assess the effect of formal training on safety.

Accidents are not perfectly reliable criteria. They are not stable measures of a driver's performance over time. Other research has shown that when people's accident records are compared over time, only a small proportion of people have accidents in two consecutive periods. Accidents satisfy few of the conditions required for reliable criteria. Accident countermeasures aimed at the driver per se attempt to change the behaviour of drivers and yet they are required to be evaluated in terms other than behaviour, i.e. accidents.

This study has shown that there are numerous difficulties in using accidents as criteria. Dependent upon whether the accidents were related to the group as a whole, i.e. the average number of accidents per driver, to individual drivers, i.e. the distribution of accidents among drivers, or to the total mileage driven by the group, i.e. average number of accidents per mile, etc., etc., these indices of safety placed the groups in a different order with respect to safety. In addition, all these rates, and therefore the order of the groups vis a vis safety, altered according to the time period chosen for the follow up studies.

Several different definitions of accidents were used. These varied according to the severity of the outcome. The three definitions used were firstly all collisions, secondly injury accidents and thirdly accidents where the cost of repairing the vehicles involved in the accident exceeded £50. These different definitions of accidents again placed the groups in a different order with respect to accident frequency.

Traffic offences were also used as criteria for unsafe and deficient driving performance. Their use was justified since it is assumed by those responsible for framing the laws, that driving errors which are a breach of the law will increase the danger on the road as reflected in accident rates. Their use was subject to exactly the same problems outlined above concerning accidents, both with respect to the rate used to describe the frequency of traffic offences and with respect to the definition or type of traffic offence.

Despite these difficulties in comparing the groups on the basis of the frequency with which they were prosecuted for traffic offences, traffic offences were found to be correlated with accidents. This relationship was found to obtain even after excluding those traffic offences which resulted from an accident. This result is particularly interesting in view of the relatively trivial nature of most of the accidents. Although fewer traffic offences occurred than accidents, since we are usually interested in the more serious accidents which occur less frequently than either trivial accidents or traffic offences, this suggests that traffic offences provide a useful criterion for unsafe driving practices on the basis of which, populations may be compared. In addition, traffic offences were observed to follow the same overall trend as accidents, i.e. they declined with age, experience and mileage, suggesting that similar surrogate dimensions of behaviour were being compared.

Given the unreliability due to difficulties in recalling exactly and possibilities of systematic errors associated with interviews and postal questionnaires, methods based on more precise details of accident occurrence are worthy of further development. Although no obvious biases in the way the information was given were apparent, this cannot be taken necessarily to imply that none

exist. There are several deficiencies in such methods and the partial success achieved in the study demonstrates the need for a careful appraisal of the alternative methods and a comprehensive scheme of the relationships of objectives required for driving, car usage and safety.

Despite the fact that there is little evidence about the internal-external validity of the self-report data relating to accidents and the difficulties described above about their use as criteria, the use of accidents as criteria for safety in this study was justified because they do, after all, provide the major focus of interest in the field of road safety. By widening the scope of the enquiry into the relationship between training and safety, it has been possible to make suggestions about the criteria to be used for selecting criteria. It has enabled us to learn more about the incidence of accidents.

During this long term study of the nature of the relationship between training, knowledge, driving practices, performance and accidents, several additional influences have become apparent. It became clear that these relationships change with time, they are subject to cultural influences and other external influences. These will be discussed briefly below.

An analysis of the data collected up to May 1972 relating to accidents and traffic offences yielded slightly different results from the current analysis. The underlying trends are very similar, but after several years the differences between the variously trained groups had become less marked. At first sight, some of these results may appear contradictory, but by repeating the analysis at different points in time, the operation of a social process such as driver education becomes much clearer. In general, external events and pressures tend to outweigh the effects of training.

One of the problems that becomes apparent when it is claimed that relationships change with time is that the explanatory power of this variable 'time' is not itself very great. It does not provide a close or accurate description of how the observed relationships with the criterion measures come about. To say that relationships vary with time is unsatisfactory since if detailed explanations are required of how such relationships arise, it is necessary to appeal to other data or theories. This problem is of course predominant in both the accident and educational research literature. However, knowledge of the influence of even these variables can at least provide some guidance as to the selection of the most important variables requiring control.

In the context of this particular sample who are in their teens and early twenties, time represents an increase in age which is particularly significant with respect to the change in life styles, behaviour and activities. Not only did the passage of time reduce the difference between the groups' accident frequency, it also itself affected the accident frequency of individual drivers. That is, accident frequency decreased with time. Time, in this context however, was found to signify driving experience as measured by the number of miles driven and the opportunity to drive as reflected in the length of time they had been driving, rather than age. In so far as the effect of age could be discerned, this seems to have been brought about by the change in employment status, or rather the change to full time employment with the consequent implications for spending and the constant need to travel. Thus the relationship between age and safety was one of association with a third variable, namely driving experience.

Both accidents and traffic offences for all groups of drivers were found to decline with age, the length of time they had been driving and the extent of their driving experience, i.e. young drivers learned to avoid becoming involved in an accident as experience and age increased. Thus safe and proficient driving, as reflected negatively in accident frequencies, is a

skill acquired over time.

In an attempt to explain how these relationships changed over time, recourse was had to another variable whose operational characteristics are also hard to define in any precise way, socio-economic status and car availability. Both of these variables were shown to be associated with the decision to drive once a qualified driver, and to account for the variation within groups with respect to the proportion of drivers who actually drove.

The sample's own occupational status (whether or not they were earning which was also age related), was also an important factor in determining the extent to which they drove. Not only did it, for some groups, provide an explanation why qualified drivers did not in fact drive at all, it was also related to their weekly mileage. In addition, occupational status was important in determining the purpose of most of the trips made and consequently the extent of night driving. Variations in the groups' weekly mileage therefore accounted for the variations in their total driving experience and consequently their accident frequencies.

A third variable accounted for a large part of the variation between the groups, irrespective of training and was still manifest several years after the start of the research project, which also has little direct explanatory power of its own, namely the sex of the students. It is difficult to know which dimensions of behaviour have been affected by these cultural influences in our society. This was the dimension along which the differences between the groups were the most consistently apparent and were not eroded with time.

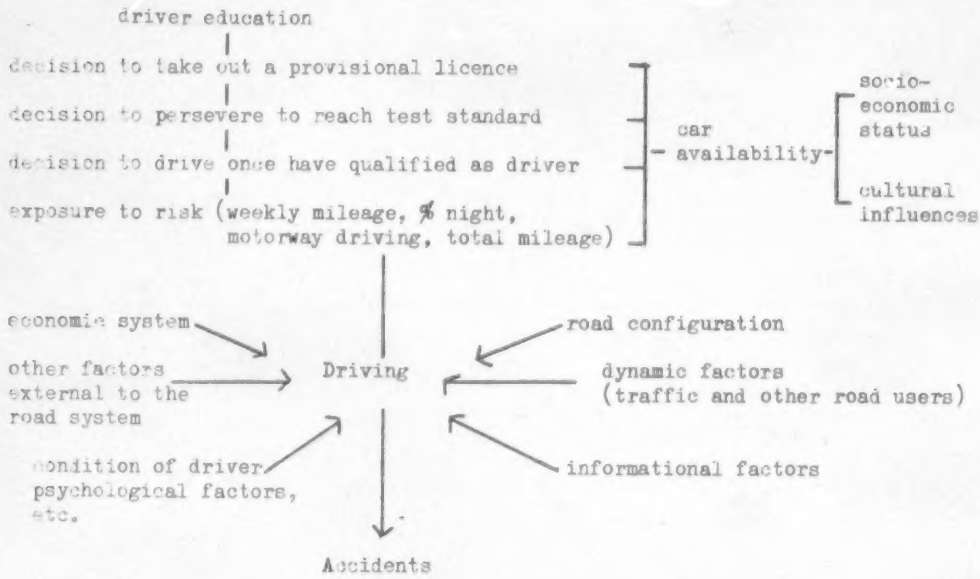
The girls drove substantially less than the boys. In addition, they drove less at night and on motorways. They differed also with respect to car ownership. They were less likely to own the car they usually drove. These differences appear to be related to the way parents and society as a whole condition young people's behaviour and expectations about cars since these (i.e. the qualified drivers, although not the groups as a whole) girls' and boys' families were equally likely to have a car or access to their employers' car both at the beginning and during the follow up studies.

These cultural influences are important in determining the driving practices of young people and consequently their accidents. The girls, as a group, had fewer accidents than the boys, but in relation to the amount of driving they did, they had been involved in substantially more accidents. However since safety was found to be an acquired skill which required a great deal of practice which the girls had not yet had, their over-involvement in accidents relative to the boys is accounted for by their lack of experience.

Thus, while it would appear that training is outweighed by cultural influences, time, socio-economic status and car availability, all these variables are in fact determining the most crucial factor, namely exposure to risk and driving experience. This study has amply testified to the critical part played on the one hand by exposure to risk in accident involvement, and on the other hand to the part played by driving experience in accident avoidance. In so far as training has affected the frequency of accidents, it has done so by interfering with the traditional determinants of who should drive (S.E.S. and cultural influences), thereby altering its students' exposure to risk and driving experience, which in turn affects accident frequency. However, since accidents as they befall individuals seem to be related predominantly to exposure to risk and driving experience, it becomes clear that driver education has altered the frequency of accidents for the group as a whole at a particular point in time, by altering the groups' exposure to risk, but that it has not altered the individual's ability to avoid becoming involved in an accident, given exposure to risk and experience identical to that of his/her untrained

counterpart. The sequence of events intervening between receiving training and becoming involved in accidents are formulated in diagrammatic form in Figure 8.1.1.

FIGURE 8.1.1 SEQUENCE OF EVENTS BETWEEN TRAINING AND ACCIDENTS


driver education
decision to take out a provisional licence
decision to persevere to reach test standard
decision to drive once have qualified as driver
exposure to risk (weekly mileage, % night, motorway driving, total mileage)
car availability
socio-economic status
cultural influences
economic system
other factors external to the road system
condition of driver psychological factors, etc.
Driving
road configuration
dynamic factors (traffic and other road users)
informational factors
Accidents

The purpose of the study described in this report is to examine more closely the types of data which may be used to assess the effects of driver education in order to ascertain whether the results show a relationship which is of substantive interest because of its nature and magnitude. The first type of evaluative criterion which is related to the overall objective of both phases of the course in driver education, namely safety, is accidents.

It can be seen that there are difficulties in drawing any conclusions about the long term effects of driver education in any of its three forms on accidents. There are several reasons for this. First of all, there is the conceptual problem of the effect being studied, namely driver education, that none of the groups are as completely homogeneous with regard to training as the group name would imply Therefore the main aspect of training which is being assessed is the relative value of formal instruction in a school environment supplemented by 15 hours of practice, simulator instruction supplemented by very little practice and no formal instruction at all within the school environment. In the main, practical experience was acquired elsewhere. Presumably, training may affect different people in different ways and this might tend to cancel out the effects on the group as a whole. This study has a bias in the fully trained group because that group consists of younger drivers and many infrequent drivers. This bias could reasonably be expected to work against the fully trained group.

The second major problem is that accidents have been shown to be related to many variables. Accidents appear to be associated with clusters of variables which make it very difficult to isolate the effect of any one variable. Even when the four groups are combined, there is rarely enough data to warrant drawing any firm conclusions about the effect of one variable. The task becomes even more difficult when comparisons have to be made between

the groups. It seems unlikely that any sample size, even of 10,000 young people - even if it were possible from an administrative and financial point of view - could yield sufficient data to make meaningful comparisons between the groups, particularly with regard to injury accidents. In any event, the conclusions reached about the validity of accidents as a criterion of safe performance, suggest that they should only be used to evaluate the safety of the road system as a whole rather than that of individuals. In a situation characterised by so many variables, any results must be hedged with qualifications and subject to interpretation, even when statistics indicate the degree of likelihood of a hypothesis being true. Experiments rarely give results to conclusive as to answer the problem completely.

This experiment, by employing numerous criteria to assess the effectiveness of driver education, has attempted to consider the process whereby the social variable, training, has affected the groups. The process by which accidents were affected, if at all, must be studied from many different angles if the results are to be generalised beyond the particular course and the particular students involved in the experiment. Thus a whole series of criteria have been developed for the study of the process itself. They have been employed to assess not only where change (for the better) has taken place but also to pinpoint weaknesses in the course itself and areas where such a course ought reasonably to have some beneficial effect.

It is pertinent at this point to summarise the long term effects of driver education with regard to accidents. Two main types of results have emerged. The first kind provide useful information about young people's driving and accidents which should be considered when driver education courses are being designed. This type of information is similar to the information obtained from the control group about how much knowledge of driving matters a sixteen to seventeen year old may be expected to have before learning to drive. In other words, these results suggest the types of difficulties encountered by young people in their driving career and the areas where training may usefully place some emphasis. When the course was first designed, very little was available to determine how such a course should be structured.

Without an understanding of the way the young driver interacts with the car and acquires experience and of the way his activities vis a vis the car change, it is not possible to know which aspects of the young driver's behaviour are modifiable. Without any knowledge of which aspects of behaviour develop autonomously from owning and driving a car and therefore invariant across different groups of drivers, it will be impossible to devise successful training courses for young drivers.

The second type of result which was obtained from this analysis was that which provided a slight indication about the effects of driver education. To a certain extent, both positive and negative results are encouraging since they suggest that training has some lasting effect on behaviour and that this can in fact be measured. Even a harmful effect has its use if the process whereby this change took place can be isolated. It would indicate that this aspect of behaviour is at least capable of modification, even if this is not an improvement.

First of all the main findings of this analysis as they relate to the effectiveness of driver education, and secondly the findings as they relate to the driving career of young people will be discussed in relation to their implications for the training of young drivers.

The first kind of results which have emerged are those which suggest that driver education has had some effect in the long term. If the differences in the distribution of accident types between the various groups is substantiated

even after controlling for experience, this would suggest that a course of driver education is capable of influencing the students' driving performance. The fully trained students involvement in manoeuvring at slow speed and turning accidents was found to be higher. The girls were found to have a different pattern of accidents, involving lack of vehicle control, particularly at low speeds. They were less likely to be involved in injury accidents per mile travelled. This may suggest that they have more difficulty in controlling a vehicle at slow speeds. But since these accidents are less likely to result in any injury, they are of less importance than other kinds of accidents. Thus accidents often arise out of events not central to the activity of driving as such - for example, reversing at night into a post. That is, drivers have to learn by experience about the role of factors other than those directly central to the car/road system. The task of training should be to minimise the part played by experience. This implies taking into account other systems external to the activity of driving.

This tends to indicate that at least two different types of course are required - one for boys and one for girls. A course designed specifically for girls would aim to enable them to surmount their cultural disadvantages and become more proficient in controlling their vehicles. Even if the type of accident in which girls are more likely to be involved is not only due to lesser manipulative ability but is solely a reflection of the conditions in which they drive, this approach would nevertheless be justified since it would reflect the girls' needs with respect to driving. On the other hand, a course tailored specifically for boys would aim to compensate them for their lack of understanding of other people and anticipation of other people's actions. Again, this may well be a cultural difference between adolescent girls and boys.

If driver training is to be used positively as an accident countermeasure, rather than as a means of acquiring a full driving licence, as it is at present, then these findings should be used as a basis for determining part of the syllabus content for a programme of driver education. However, it can be seen that accident analyses such as this can only provide a guide to the content of such courses. Studies similar to the present one, i.e. the evaluation of courses in driver education in terms of accidents, have reached the point where they can make little further contribution and should be supplemented by investigation of the driving process itself and young people's interaction as outlined in the conclusions to Chapter 5. This therefore calls for small scale studies in depth rather than more large scale studies of this nature.

The major finding of this study, that driver education has little effect on accident involvement when all other potentially important variables are controlled, is only to be expected since the key variable, the teaching process itself had been subjected to very little scrutiny and change. The very detailed analysis of the groups' accident involvement has shown the importance of controlling as many variables as possible. Many differences occurred between the groups but most of these were subsequently explained by variables other than the training factor. It is also of interest that different criteria show the relative safety of the groups in a different order. An attempt has been made to explain how this had occurred and to show how misleading some of these criteria may be.

This study has been particularly interesting because, by working at such a wide range of variables, it has been possible to understand why other research workers in this area have noted findings that appear to conflict with each other. This further points to the difficulty in this kind of study in comparing the effectiveness of different kinds of course when the criteria used are caused by many variables rather than just one or two.

Very little is known about the training of drivers. Greater knowledge

about training is necessary for development of curricula for driver education. Driver education is one form of driver training, namely classroom instruction, on matters relating to driving, in a school environment for 16 - 17 year olds, supplemented by a considerable amount of behind the wheel practice. There are of course many forms of driver education and they need not only be directed towards teenagers. However, it is the application of training principles within the school system that is being studied here. If some aspects of driving are to be taught in the classroom, then a knowledge of the total training process is necessary in order to determine which topics should best be covered in the classroom, the relative emphasis to be placed on these topics and the best way of communicating this information to the students.

The first major finding is that driving proficiency, as measured by accident free driving, is indeed learned behaviour since proficiency was found to increase with mileage, i.e. practice. This is important because it suggests a driver continues to learn even after passing his test and if he is capable of acquiring this skill, there is no reason why some of the skill might not be learned while under the supervision of an instructor or in the classroom, i.e. in a safer environment. The question, however, arises "What is the new driver in fact learning?" since he had already learned to control the vehicle. It seems likely that this skill, that is the capacity to manipulate the vehicle in traffic conditions, will also be increased. However, it seems more likely that more is involved in this learning period than the acquisition of skill, namely the development of accurate judgement of speed and distance and therefore a realistic assessment of whether he can undertake a particular manoeuvre in the circumstances.

It seems more likely that an accident will serve as a useful reinforcement of the training he has received, if the driver is able to assess accurately the part played by his own driving. Learning is unlikely to take place if he cannot internalise the blame and instead blames external factors such as bad road surface. Comparisons of the students' self-rated and actual responsibility for the accident showed that none of them were very good at this. It seems that training ought to help them, once they have been involved in an accident, to at least profit from the experience.

Another important finding was that even when accidents were subdivided on the basis of the students' responsibility, even involvement in accidents where they were not to blame, decreased with experience. This would suggest that very few accidents could not be avoided even in those instances where the driver is in no way to blame for the accident. This would suggest the necessity for explaining this point to young drivers and teaching them how to avoid becoming involved in an accident. This probably requires greater emphasis on "reading the road", anticipation of other road users' actions and understanding the needs of other road users. This is a very different approach to teaching young drivers how to avoid causing an accident where the emphasis is on correct road procedure. Both approaches are necessary.

There is one other finding that has important implications for training. About 50% of young male drivers were involved in an accident within a relatively short period of passing the driving test. Yet a candidate taking the DOE driving test is required by the Motor Vehicles (Driving Licences) Regulations (Ministry of Transport, 1968) to satisfy the person conducting the test on three general requirements: (a) that he is fully conversant with the contents of the Highway Code, (b) that, generally, he is competent to drive without danger to and with due consideration for other users on the road, a vehicle of the same class or description as that on which he is tested. The third requirement deals with details of vehicles on which the test was conducted allowing for differences in reversing gears, track driven vehicles, etc. It is the second condition which is relevant to this study. Given that this

is the criterion by which a person's driving performance is assessed, it would appear that the driving test is not very good at assessing this. It seems that there is something wrong with a test which sets out to assess whether a person is competent to drive without danger, when shortly afterwards, many of these test candidates are a danger to other road users.

It may be that there is a case of altering the standard of driving required to pass the test, on educational grounds alone. Presumably such a test would require a greater number of hours behind the wheel than is at present the case. The advantage of this is that an inexperienced driver is required to drive under the supervision of another driver at that period in his driving career when he is most likely to be willing to take advice and to improve his driving, namely before he has been successful in the official driving test. It seems likely that success in the test conveys to the new driver that he is competent and safe. Postponement of this would have the effect of increasing his skill relative to his confidence. A test which required a higher standard of driving competence has important implications for training. It would increase the length of time a new driver undergoes training (formal or informal) and thereby would increase the scope of such training. One of the problems of a course consisting of 30 + 15 is that there is insufficient time to practice what has been taught in the classroom, particularly with regard to observation and judgement. It seems likely that close supervision of these aspects of driving is very important, yet after fifteen hours of driving, a driver is only just beginning to "read the road". It may be that the supervision of new drivers ends just at the point when they are learning to do this. Freedom from control may imply to the driver that he has mastered this aspect of the driving task.

The major task in driver preparation that requires to be done is to arrive at some objective standards for safe and proficient performance. This step is necessary in designing a course for learner drivers, for designing a course for instructors and for evaluating driver behaviour. Without such standards which can be used as criteria for assessing performance, it is difficult for instructors to aim at the same standards of performance which is to be expected from the student and to know whether they have been achieved or not. Since the task of teaching a person to drive implies that the learner progresses from a state of little knowledge or skills to a state of more knowledge and skills, the ultimate objective state must be clarified if it is ever to be achieved. It is likewise difficult to determine the methods that can be used to teach these skills without knowing what has to be taught.

Our current research has indicated the positive relationship between experience (as measured both by length of time since passing the D.O.E. driving test, and the driver's own estimate of his total mileage since passing the test) and the ability to avoid causing (in the legal sense) an accident and becoming involved in an accident, and to carry out various driving tasks with fewer errors. More errors, some of which result in accidents are made in the early years of one's driving career. This demonstrates clearly that safe driving is an acquired skill.

The assumption was made that the driver's behaviour will lead to an accident. Our investigation into all the accidents, including those where the driver in our study could not, according to legal criteria as defined by the Highway Code, be held to blame, indicated the deficient nature of many of the procedures which are laid down for negotiating hazards and/or inadequate emphasis on certain aspects of the procedures, i.e. that accidents are not just a result of an 'error' in procedure for carrying out a manoeuvre. Conversely, an analysis of the driving data collected during a drive, some time after passing the test, showed that incorrectly carrying out the procedures for a manoeuvre did not lead automatically to an accident.

Thus it can be seen that the procedures themselves may be deficient i.e. not based on the minimum invariant principles for negotiating the hazard and that the procedures may be carried out correctly, but the manoeuvre should never have been carried out at all. For example, with regard to driving in fog, no specific procedures will guarantee safety, therefore the general rules for the driver are to minimise driving under such conditions and to endeavour to compensate for the effect of fog by the increased use of lighting and warning devices e.g. horn. The only other procedure which can be laid down is the general one of reducing speed.

The results of our research indicate that the relationship between the correct performance of procedures and the absence of accidents cannot be substantiated. There is no evidence in the research literature for the relationship between improper driving and accidents based on explicitly stated, objective criteria. Improper driving can only be implicated if it can be demonstrated that it occurs more frequently as a causal factor among accident involved drivers than among those not involved.

The task of training i.e. driver preparation, is therefore to reduce the critical period to as short a time as possible so that fewer accidents occur. (It should be stated that we do not know what time is in this context). Effective training therefore is one that allows learner drivers the opportunity to build up appropriate schemes or procedures for the various driving tasks. Such procedures, to ensure the maximum degree of safety (the ideal of 100% will never be attainable given the many factors which can transform the driver's activities on the road into an accident) must be based on an understanding of the invariant principles governing safety. Driving is currently taught as a series of rules rather than a social and manipulative control process dependent upon the principles governing safety, e.g. the steering style of 10 x 2 and push and pull is taught without demonstration of its superiority with respect to safety, over the other methods. This implies structuring the driver's task from the point of view of the driver's activity e.g. building up a classification of hazards to be avoided and risks to be minimised. Training can then be seen as giving the driver a series of tasks of differing complexity depending on the configuration of the road and the presence of other road users. The task of the instructor involves choosing the series of tasks, explaining the principle which guides action, and providing the pupil with information about his performance. This in turn implies a set of explicit criteria for judging performance which can be easily understood by the pupil and administered by the instructor. Thus logically several steps are required:-

1. Taxonomy of the different hazardous situations and manoeuvres arising from road and traffic configurations.
2. As comprehensive a list as possible of the characteristics of invariably negotiating such hazards safely
3. Procedures for carrying out such manoeuvres.
4. Ordering of manoeuvres, i.e. grading in terms of difficulty, for teaching purposes.
5. Setting up criteria for assessing the performance of such procedures which can be used by instructors and examiners.

The conclusions reached by our studies suggest that where the task of changing driver behaviour is seen as one of affecting the attitudes, skills and knowledge of the driver directly, by either propaganda or education, and where the relationship between them and accidents is not known to be a causal one, the likelihood of achieving, or even being able to measure, a substantial increase in safety, is limited. The only types of changes whose outcomes we can be sure of measuring in terms of accident frequencies are changes in

our physical environment, e.g. by improving the information provided by the road configuration, about the desired driver behaviour. If education, propaganda or driver improvement are to be used as preventative measures, we will have to look for responsiveness to these measures in areas other than accidents, such as behaviour which is known to be related to safety.

The second type of evaluative criterion which is thought to be related to the overall objective of both phases of the course in driver education, namely safety, is traffic offences. As with accidents, it can be seen that there are difficulties in drawing any conclusions about the long term effects of driver education. Although driver education was usually observed to be associated significantly with a reduction in the number of traffic offences, this relationship was found to be one of association with a third variable, namely experience and exposure to risk, rather than a direct causal one. Traffic offences were found to decline with age, experience and mileage. There was some indication that in the first 5,000 miles the pre-driver and fully trained students had fewer traffic offences than the other groups. Thus it would appear that in so far as driver education had been effective, it was in the short term only. Since most of the traffic offences committed in the early stages of the sample's driving career were predriving responsibilities, it seems that it was in those areas which are not central to the task of driving, e.g. taxation and insurance requirements, construction and use regulations etc., where the course had been effective in informing the students about the way other systems impinge on the activity of driving.

However while the cognitive factor appears to be important in error free, as in accident free, driving, this was shown to be derived mainly from the practical activity of driving rather than from the classroom instruction in the form given to the students in this experiment. The likelihood of being prosecuted for a traffic offence declined with experience. In particular, predriving responsibility offences declined with experience. Thus, in so far as this type of driving error declined, it may be reasoned that young drivers learn more quickly how to conform to those standards of behaviour which are external to the driving task - probably because their infringement is more readily observed and detected by others. It would appear that little had been learned on the course which was related to error free driving, as reflected negatively in prosecution free driving (type 5 charges), as opposed to success in achieving test standard. In so far as the cognitive factor has been shown to be important, it implies that in principle training ought to be capable of preparing a driver to drive in such a way as to avoid prosecutions for traffic offences. On the other hand, since this learning appears to be acquired chiefly through practice and appears to be invariant across groups who have received different forms of training and who have been subject to different cultural and socio-economic influences, it may suggest that these skills can only be acquired through the activity of driving, since the requirements of the driving task are effected by the interaction within the driver/car/traffic/road system rather than by external factors. Consequently the part played by training may be very limited.

This study has shown the critical importance of exposure to risk and driving experience for learning to avoid being charged with a traffic offence. There was little evidence to suggest that it was the individual characteristics of the young person per se which was responsible for prosecutions. The evidence points strongly to the activity of driving and the constraints of the car/road/traffic system as being primarily responsible for driving in such a way as to be charged with a traffic offence. In so far as these findings are very similar to those relating to accidents, traffic offences are useful criteria for program effectiveness. In addition, because of the correlation between traffic offences and accidents, and the fact that though less frequent than crashes although more frequent than injury accidents, they could be used as

substitute criteria where there is insufficient data relating to accidents.

The logic of introducing courses of driver education into the school curriculum implies the acceptance of the cognitive factor as an important element in the driving task and safety. Learning in the classroom is characterised as focusing upon the principles, procedures and rules governing driving practice and this is conveyed by means of language and visual representations. The driving task is seen as requiring the acquisition of specific sensori-motor skills and patterns of behaviour and is usually taught as a purely practical activity. Thus driver education implicitly assumes that there is some overlap between the two types of instruction. Previous research has tended to take this for granted and driver education has expanded in the United States without any evidence that this is in fact the case.

A previous report has attempted to investigate the limited information that is available in order to shed some light on this relationship. The data are in many respects inadequate because at the outset of the experiment, the critical nature of the relationship between class and car learning was not immediately apparent. Although it appeared that as a method of instruction driver education was, four years after the start of the project, no more effective in helping students reach test standard, and after six years, was found to be less effective than other methods, this was due to factors external rather than to the method of instruction. When only those who had acquired a full licence were considered, driver education was found to be instrumental in helping students reach test standard, up to six years after the start of the project. It seems likely that if the course had been offered to only those who wanted to learn to drive, the effects of less motivation and lack of a car would not have confounded the effects of the experimental variable. The relationship was a causal one and large enough to be worthy of further study.

In addition, a further report has offered some evidence which justifies the assumption that there is some transfer between class and car instruction in the driver preparation courses and subsequent driving practices and knowledge - although not as great as might be desired or expected. This conclusion is however only valid for the full course of driver education i.e. when the classroom phase is supplemented by 15 hours of driving instruction. It would appear that the part of the course concerned to impart information relating to driving practices was not instrumental on its own in producing behavioural changes. Thus the critical nature of integration of classroom and practical instruction is clearly apparent. This is substantiated by the fact that this finding is observed in both the boys' case and the girls' case. The knowledge test showed the girls' driving knowledge to be inferior to that of the boys. All the data relating to driving practices showed that the girls differed substantially from the boys in their patterns of car usage. If it is to be successful, driver education must be geared to the needs and skills of those taking the course. This would imply emphasis on different aspects of driving for girls and boys and much greater co-ordination and feedback between the two phases of instruction.

The purpose of carrying out this experiment was to ascertain whether the relationship between driver education and the criteria described above were of such a nature (i.e. causal) and magnitude as to be of substantive interest. Affirmative answers to these questions can be given. Relationships have been established that the knowledge acquired in the classroom is useful in qualifying as a driver, at least for some people and that this knowledge is only advantageous if it can be put into practice at more or less the same time as it is acquired. This implies that driver education will only be of value in the case of these students who are allowed to drive, i.e. are at least seventeen years old. This effectively means that the results of this study

can only be generalised to those students who stay on at school beyond the minimum school leaving age. If the classroom phase of the course is given to students who do not have the opportunity to drive, then the knowledge remains at a fairly abstract level and cannot be viewed as training (whose purpose is to teach skills) but rather as propaganda which is concerned to affect decisions to act in a particular way, and tends to be forgotten.

However, given the design of the experiment and the fact that the objectives of the classroom phase of the course were not broken down and specified in operational or behavioural terms, evidence of the transfer can only be stated at a very general level. Because of the reduction in mileage driven, it can at least be stated that the transfer was on the whole, a pro-active one, i.e. class learning produced positive transfer in the car. Since even those students who had not yet passed the test but had received more behind the wheel practice as part of the course did slightly better in the knowledge test, it may be reasoned that the car learning facilitated class learning.

It is difficult to know which aspects of the course resulted in the reduction in mileage. It is therefore difficult to say with any certainty which aspects of the course require improvement or deletion or should be retained. This would require that the various task achievements in both phases of the course be comprehensively mapped out and that proficiency tests be designed to measure the performance (both written and practical) in each task. It is easier to specify which aspects of the course were not successful, e.g. the advice to wear seat belts.

Likewise, little can be said about the means of transmitting this knowledge in the classroom. This would imply experimenting with different resource material, size of class, teacher-pupil interaction etc. Standard classroom procedures were adopted with little knowledge about how useful they are for the purposes of exerting direct influence on behaviour outside the classroom.

However, at this stage the major task of those concerned with driver education is exact specification of objectives in both phases of the course and the means of achieving them. For example, if the aim of driver education is to inculcate safe practices, rather than simply reduce the number of accidents, then vehicle maintenance may validly be included in the course. Thus it can be seen that one of the problems of the driver educator is the amount of knowledge that is available about the objectives that are aimed at and about the means of achieving them. It is less than useful to suggest accident rates can be reduced through changes in behaviour, if little is known about their exact behavioural and other causes. It is therefore the responsibility of those carrying out research into accident occurrence and safety to specify where possible the causes and the countermeasures in behavioural terms which the driver educator can then use as his objectives. The best that the driver educator can do at present is to supplement the evidence available by a series of explicitly stated assumptions. Subsequent reports will aim to investigate the causes of the accidents in which these young people are involved so as to provide information upon which to base further training improvements.

Despite the difficulties both in pinpointing which aspects of the course were transferred to subsequent driving practices, and in knowing how wide a range of activities should be included under the heading of safe practices and therefore included in the course, this study is important since it has demonstrated some effect as measured by the reduction in mileage. Since this was not an objective of driver education, it is very difficult to interpret this finding. Since the groups' use of the car has been affected, the course can be said to have effected a behavioural change. However, as expressed in weekly or monthly mileage, this is a change at a very general

rather than specific level. Other than this, there are no apparent effects on driving practices.

While the ultimate concern is one of safety, little can be achieved by driver education in this area unless the cognitive element is shown to be important in driving practices. The remaining evidence as it relates to this is contradictory. While some knowledge (and this has been shown not to be constant) is necessary to pass the driving test, this does not increase as skill and experience increases. Since our definition of knowledge implies that it must increase with skill, this tends to imply that the criterion for measuring knowledge tended to measure the rules and procedures of driving rather than the kind of knowledge used in the driving task which increases with experience, e.g. anticipating other people's actions, greater understanding of the capabilities of the car under different circumstances etc. Alternatively, it may imply that the course did not convey this kind of information to the students to any greater extent than the traditional forms of training.

If driver education is to be successful in its objective of producing safe and proficient drivers, then it is imperative that the criteria which are to be used by those responsible for driver education have predictive validity with respect to safety. Since safety, as reflected in accident frequencies, seems to be so critically dependent on exposure to risk (Chapter 5) and driving experience (Chapter 4), this amply justifies the use of driving practices and exposure to risk variables as criteria for evaluating the effectiveness of driver education. In addition, because of this relationship between exposure to risk, driving experience and accidents, and because of the relative rarity of accidents, an attempt can be made to assess the predictive validity of the intermediate criteria in terms of exposure to risk and experience. In so far as knowledge of the rules, procedures and conventions of driving did not increase with driving experience, it can be said that knowledge of this type had little predictive validity. On the other hand, since driving performance did improve with experience, measures of driving performance can be said to have some predictive validity. There was however no evidence to suggest that driver education had affected driver performance.

This study of training and accidents has shown that the cognitive factor is an important element in the driving task and safety. However there is little evidence to suggest that driver education had been instrumental in altering driver behaviour. It appears that learning (as measured by accidents) took place during the activity of driving. Training affected driving, but the way young people interacted with the car and the decisions they took about when and how much to drive, rather than the process of driving. While it is possible to discern the importance of the cognitive factor in driving, it is less easy to specify what it is that is being learned. Suggestions were made earlier in Chapter 5 about the way the data might be examined in an attempt to understand what the young driver is learning and how this learning takes place. Until we know what the driver learns which is instrumental in minimising the hazardous nature of our road and traffic environment and how this learning takes place, it is difficult to arrive at objective and valid standards of safe and proficient performance which can be incorporated into a course for training drivers. However, in so far as this study has shown the importance of the cognitive factor, this would suggest the potential usefulness of training, once these relationships have been clarified.

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